SEPTEMBER 1950

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TO MAKE IT HANDY

Products and literature in this issue are listed on these pages. There are three indexes. (1) editorial items on new equipment, new products, new literature; (2) products advertised; (3) advertisers.

NUMBERS EXPLAINED

Advertisements:-There is a page number on the postcard for each advertisement. Before the number may appear, L, R, T, B (left, right, top, bottom) locating the ad on the page; small letters following (a, b, c) indicate additional products in the advertisement.

Editorial Items:-Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the postcard for each item in three editorial departments: Equipment News, New Products, and New Literature.

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Number seven coming up.

Kaiser Buys a Potline for Transplanting

If Henry J. Kaiser is not exactly a miracle man he has at least brought to life one-third of an aluminum giant entombed in California since the end of World War II. Specifically, Kaiser Aluminum & Chemical Corp. has bought from the government one of the three potlines (140 pots) in the idle aluminum ingot plant at Riverbank, Calif., including electrical rectifying equipment.

Alcoa operated Riverbank during the last war. Alcoa relinquished it at war's end. Since 1945 the plant has been idle, primarily because the cost of electrical power to run it has not been sufficiently low to attract peace-time operation.

What Kaiser plans to do with Riverbank's 140 pots: Move the pots and necessary rectifying equipment to the company's Mead aluminum reduction plant at Spokane, Wash. The pots will constitute a seventh potline at Mead. When in operation they will account for an additional output of 40 million pounds per year of aluminum ingots. They should be in production by next March.

What Kaiser expects in aluminum output after the company puts into operation the 140 pots from Riverbank: A short time ago the company installed additional pots in its aluminum ingot plants at Spokane and Tacoma to increase the combined capacity by 40 million pounds per year, which brings the present rated annual capacity to 300 million pounds. Company officials, who point out that Kaiser now makes 20 percent of all primary aluminum produced in this country, say that after the additional potline from Riverbank is installed, the combined annual capacity of the two plants will be 340 million pounds.

At Baton Rouge, La., where the company produces alumina from bauxite, changes are being made to provide more alumina for the expansion under way at Spokane.

Why Kaiser is expanding: It's the war, of course. Henry Kaiser says that the biggest output of aluminum by his company has occurred this year. The company continues to establish its own sources of bauxite, and has bought 4,600 acres of bauxite land on the island of Jamaica. Options have been taken on additional acreage.

At Baton Rouge, La., the Jamaica product is being testprocessed on a pilot plant scale, with results thus far "most encouraging." The company says the Jamaica bauxite will require only half the haul by water which is required by the ore presently used.

METAL MAKERS WANT RIVERBANK'S POTS

Kaiser has definitely obtained one of the three potlines operated in the government aluminum reduction plant at Riverbank during the war by Alexa. There stillseemed a possibility last month that Harvey Machine Co., fabricator of aluminum at Torrance, Calif., would get final approval from the government's General Services Administration at Washington for the purchase of certain properties at Henderson, Nev., to be used for the manufacture of aluminum.

As reported in PPI (Mar. 1950), Harvey Machine negotiated an agreement with the Colorado River Commission for Nevada for facilities to make aluminum on a site which is part of the former Basic Magnesium plant. The company was interested in idle equipment in the aluminum reduction plant at Riverbank. Up to a short time ago the question of electrical power available to support the projected Harvey operation was a stumbling block to final government approval. It is understood that Harvey has taken an option on a tract of more than 700 acres in western Montana as a possible alternate site to Henderson.

Last month Harvey had rivals contending for the remaining pots at Riverbank. Well informed sources said that the contestants were Kaiser Aluminum, Alcoa and Reynolds Metals. A bothersome angle in the picture was the problem of electrical power necessary to operate the pots. One possibility was that they might be moved to some point in the Southwest where large supplies of natural gas are available and could be used as the source of power. Another possibility was that some of the pots might remain in California and be moved northward to a site where power from Shasta dam would be allocated for their operation.

Big Paper Mill for Vancouver

Two large British Columbia paper makers, Canadian Western Lumber Co., Ltd., and Pacific Mills, Ltd., have joined forces (50-50) to establish a new firm, Elk Falls Co., Ltd., to build a \$35 million pulp and paper mill at Duncan Bay on Vancouver island, B. C. The project takes the place of a sulphate mill that Canadian Western was contemplating last year to build at the same locality.

The first unit to be erected is a newsprint mill designed to produce between 75,000 and 100,000 tons per year. It is planned that other units will be added later, although the nature of the future expansions has not been disclosed. Construction of the first unit is expected to begin at once.

The new plant will produce newsprint from salvage wood and small logs. Canadian Western holds a forest management license in the area, the license involving around 200,000 acres. Until regenerating timber affected by the license attains pulp wood size, the wood supply for the plant will probably be derived from salvage and from timber of small diameter obtained from local farmers. The paper will be manufactured from mechanical pulp produced in the plant and a certain amount of sulphite pulp obtained from other sources, possibly from Pacific Mills' plant at Ocean Falls, B. C.

Paul E. Cooper, president of Pacific Mills, says the newsprint machines are designed to operate at 2,000 ft. per min. with a newsprint ribbon 267 in. wide.



Three expellers, maybe four

Western Solvents May Enlarge Plant

Western Solvents, Inc., which put into regular operation at Longmont, Colo., early this year its plants to produce oil from safflower seed, is considering the installation of an additional expeller in the near future. The plant now has three expellers with a total capacity of 100,000 lb. of seed per day, which is capable of yielding between 24,000 and 28,000 lb. of the drying oil from seed ranging in oil content from 27.5 to 31.0 percent.

Additions to the plant during this year include a decortication unit designed by the company, new grain storage facilities and a pelleting unit. The company is filing patent applications covering some aspects of the processing methods and equipment.

The company is purchasing all the seed it processes. A total acreage of about 60,000 is planted in safflower in the region around Longmont, a town 30 mi. north of Denver. Nothing but safflower has been processed by the plant since it began operating. Next month the company plans to begin processing the N-852 and N-8 varieties, which have higher oil contents than the type heretofore handled.

Company officials include Albert M. Lane, president; Dr. Leo M. Christensen and James D. Metzger, vice presidents; and Mark Benson, production manager.

Mountain Fuel Plans Gasoline Plant

Mountain Fuel Supply Co. has let a contract to Steams-Roger Manufacturing Co., Denver, for the construction of a \$1-million plant in the Church Buttes gas field in Uinta county, Wyo., for the recovery of gasoline from natural gas. The probable daily capacity of the plant will be 100 million feet of gas. The project is scheduled for completion in December. The gasoline will be incorporated in motor fuel in the Salt Lake City area, where two petroleum refineries, Salt Lake Refining Co. and Utah Oil Refining Co., now operate.

The plant will be the first such installation to be built by Mountain Fuel Supply, which furnishes natural gas in the Salt Lake City region. Most of the gas comes from the Church Buttes field, which is being further developed. A company official says that known reserves in the field total 193 billion feet, and that the probable ultimate reoverable reserves are 507 billion.

Stauffer Expands Research

Stauffer Chemical Co., San Francisco, is enlarging its research facilities at two localities, one in the West and the other in New York state. At Richmond, Calif., the company has completed a new wing on its laboratory building in order to provide more space for investigations in the synthesis and formulation of new agricultural chemical products, and for development of the company's industrial chemicals. Dr. Chester L. Arnold, who directs research and development for Stauffer Chemical, heads the staff at Richmond.

The company is now building at Chauncey, N. Y., a new research laboratory for the eastern division to handle problems in the field of organic and agricultural chemicals. The laboratory will bring together company research and development men from several other localities, but it is not contemplated that Stauffer men from the Pacific Coast will be involved.

Powell River Expanding Again

Powell River Co., one of the largest manufacturers of newsprint, continues to increase its output and expand production facilities in response to the continued heavy demand for pulp and paper being experienced generally by Pacific Northwest paper makers. The company has awarded a \$1.5-million contract for construction of a new pier and warehouse at its plant at Powell River, B. C. This project is part of a \$3-million plant enlargement program to provide higher capacity to manufacture sulphite pulp and newsprint by 1952. Improvements on paper machines are part of the program. The company expects to increase output of newsprint by an additional 11,000 tons this year by speeding up the machines.

Powell River, in the first six months of this year, produced 146,700 tons of newsprint, which was a gain of 3.9 percent over output in the corresponding period of 1949. During the first half of 1950, sales of unbleached pulp totaled 19,700 tons, an increase of 13.8 percent.

Shasta to Make European Type Board

Shasta Plywood Co., a subsidiary of U. S. Plywood Corp., plans to erect a \$2-million plant at Anderson, in northern California, to manufacture Novoply, a three-ply, resin-bonded woodboard from wood shavings and chips. Douglas fir, ponderosa pine and white fir will be the principal sources of the wood waste. The product, which has been in commercial production in Europe under the name Novopan for several years, has not been manufactured commercially in this country. U. S. Plywood has obtained exclusive rights to the process in the United States and Canada. The new plant will be built near Shasta's plywood plant at Anderson. Capacity will probably be 40 to 50 million feet per year on a 1-in. basis. Completion of the project is scheduled for February 1951. Shasta's engineering staff is building the plant. Supervisory engineer is Warren Smith of U.S. Plywood Corp. He has moved to Anderson from the New York office and will be assisted by the New York engineering firm of Lockwood, Greene, Inc.

The product is a resin-impregnated composite of three layers, the two outer layers being composed of wood shavings and the core of wood chips. The product, which is formed in specially designed hot presses, can be made

in thickness from A in. to 11 in.

Lawrence Ottinger, president of U. S. Plywood, says that "Novoply will be competitive to plywood in many fields, but it is the policy of our company to develop anything that has merit, regardless of its possible effects on our other products. The utilization of wood waste is most important because of the diminishing forests and because only the best part of tree or peeler logs can be used for plyood." The product is intended for use in manufacture of furniture, decorative panels, doors, as a base for high-pressure laminates, etc.

Fred Fahrni, Swiss engineer with whom the company

Fred Fahrni, Swiss engineer with whom the company has negotiated the agreement to utilize the process, says the process has been in commercial operation in Europe since 1947. The original plant was built by Keller & Co. at Klingnau, Switzerland. Other plants are in operation

in Holland, Czechoslovakia and Belgium.

Moss Landing Gets Another Kiln

Kaiser Aluminum & Chemical Corp. is installing a second kiln in its chemical plant at Moss Landing. Calif. The kiln, 250 ft. long by 9.5 ft. in diameter, along with auxiliary equipment, should be in operation by December. It is being installed to increase the flexibility of the plant to produce magnesite and other magnesia products as well as deadburned dolomite. A. C. Byrns, director of the company's chemical division, described in detail in an article in Chemical Engineering, May 1950, the refractory operations at Moss Landing and related Kaiser plants.

Molybdenum Co. Exploiting Bastnasite

Bastnasite, the fluocarbonate of ce;ium and lanthanum, may become an important California-based source of these rare earth metals if expectations of Molydenum Corp, of America are borne out. Early this year the company bought a number of claims covering a bastnasite deposite which was discovered in 1949 in San Bernardino county, Calif. The company is sinking a shaft to 100 ft., says the California State Department of Natural Resources, Division of Mines, and plans to drive cross cuts to two large veins. At Reno, Nev., the U. S. Bureau of Mines has been investigating bastnasite from the standpoint of its milling qualities.

The California Division of Mines considers that the real significance of the bastnasite deposit in the state will be established only after Molybdenum Corp. has adequately made the underground exploration. If the utility of the ore turns out as it is hoped, geologists in the state agency believe the deposit should be adequate to meet all domestic requirements and make this country

no longer dependent on imports.

Interest in the mineral as a source of cerium and lanthanum arises from the fact that imports of monazite sands have been largely cut off by the principal former supplying countries, Brazil and India. Imports of monazite sand and other thorium-bearing ore totaled 4,980 short tons in 1943, fell to negligible amounts during World War I, rose to 3,686 tons in 1946 and again dropped to 2,397 tons in 1947. After 1945 the U. S. Bureau of Mines ceased publishing the amounts of imports from the individual supplying countries because of security regulations, but the major portion in 1947 came from Brazil.

Last year a new company, Rare Earths, Inc., began operations at McCall, Idaho, to separate monazite from deposits of heavy sands in the area and to ship the product to Lindsay Light and Chemical Co. at Chicago for extraction of uranium, thorium and other rare earths from the material.

Cerium, the most abundant of the rare earth metals, is used largely in the preparation of pyrophoric alloys. However, an important application of cerium receiving increased attention is its use as an alloying agent to improve the high temperature performance of magnesium and aluminum for use in aircraft and gas turbines.



Number five coming up.

Permanente Expands Cement Capacity

Permanente Cement Co. plans a \$3.5-million expansion program to increase the output of cement from its plant near San Jose, Calif., by 25 percent. As expanded the plant will have a new annual capacity of 28 million sacks, or 7 million barrels. The new capacity is planned to be in production by next February. The expansion centers around the installation of a fifth kiln, which, like the others, will be 463 ft. long and 12 ft. in diameter.

Addition of the new kiln marks the latest in a series of additions to the plant, which is now one of the largest in the country. When the plant first went into production late in 1939 to supply cement for the Shasta dam in California, it had only two kilns and a rated annual capacity of 2.5 million barrels. During 1940 a third kiln was added to bring the capacity to 3.75 million barrels, and in the next year the rating was increased to 5.0 million by the addition of a fourth kiln. In 1947 capacity was again raised to a new level of 5.25 million barrels when a clinker cooling system was installed. Last year, changes made at the plant without major installations raised the capacity to its present 5.75 million barrels.

Board Gives California Water Aims

Following completion of its organization work (see PPI, May) the California State Water Pollution Control Board has released an interim document, prepared by a special committee, to acquaint industry with the line of thinking which the board is following at this time in setting up basic principles. Recognizing that the subject is complex, the board named the committee to study the problem, review what has been done in other states and prepare a preliminary draft setting forth the fundamentals involved in establishing equitable rules.

A copy of the document may be obtained from the executive officer of the board at State Office Building No. 1, Sacramento. In issuing the document the board

stresses the fact that it is not an enacted law or regulation, but that the material is being distributed to stimulate comment. Included in the statement is a proposed method of analysis of waste disposal problems and a tentative list of water purity requirements for industrial and other uses.

The committee consisted of Gerald E. Amold, director of the water department, city of San Diego; Don McMillan, city manager of Pasadena; A. M. Rawn, chief engineer and general manager of Los Angeles county sanitation districts; and Frank M. Stead, formerly executive director of the state board.



New asphalt plant at Point Wells.

Stancal Makes Asphalt in Washington

Stancal Asphalt & Bitumuls Co. is operating the first asphalt plant in western Washington, a modern, highly instrumented unit built at Point Wells, north of Seattle. A design feature is the use of automatic proportioning and control equipment for making blends. The plant, costing over \$500,000, has a capacity of 3,500 bbl. per day, which could be increased by minor modifications. The raw material, which is brought in by tanker from the Standard Oil Co. of California refinery at Richmond, Calif., is a prepared blend of paving-grade asphalt and specification stove oils, the mixture having a viscosity sufficiently low to permit bulk shipment by water.

Products normally produced at the new plant include seven paving grades, four rapid curing grades (RC cutbacks), four medium curing grades (MC cutbacks), and four slow curing grades (road oils). Specification stove oils will be produced later.

Construction of the plant at Point Wells has enabled Stancal to eliminate the previous rail haul of paving asphalts to the Seattle area from the company's older asphalt plant near Portland, where Shell Oil Co. also has an asphalt unit.

Heart of the plant is a pipe furnace, through which the raw material is pumped, and a fractionating column 54 ft. high by about 9 ft. in diameter. Preheated raw material is pumped through the furnace and discharged into the lower part of the column where partial vaporization occurs. Heavy asphaltic residue is withdrawn from the bottom of the column, an intermediate cut from a side stream and a light oil from the top of the column. Stripping steam is used, and the column can be operated under a 27-in, vacuum.

A feature of particular interest is the use of specially designed automatile proportioning and control equipment to maintain the viscosity and penetration of blended products at specified points with a minimum of manual effort. Essentially this involves the use of a ratio flow controller to govern the relative rates at which the component oils are proportioned into a motor-driven line blender. Small samples of the blend pass continuously through an indicating instrument adjusted to give a blend of required viscosity and penetration. Any deviations of the blend from these specifications are electrically transmitted to the ratio flow controller, which then readjusts the relative rates of flow of oils into the final product.

Plant superintendent is W. W. Trudgen. He joined Standard Oil Co. of California in 1921, was transferred to California Asphalt Corp. in 1946, where he remained until going with Stancal early last year.

Cal Spray Opens Phoenix Mill

California Spray-Chemical Corp. has completed the construction of a dust mill, branch office and warehouse at Phoenix, Ariz. Daily capacity of the mill to produce insecticidal dusts is 35,000 lb. The plant is designed to manufacture products for control of pests infesting orchards, field and truck crops, livestock, etc. Basic chemicals used in the products include DDT, Lindane, Toxaphene, Chlordane, BHC and others.

The company, whose main plant is at Richmond, Calif., decided to open its operations at Phoenix in view of the growth of farm and ranch production in Arizona during the last several years. Both Arizona and New Mexico are the marketing territory for the new plant. Up to this time the territory has been serviced by fieldmen operating out of Whittier, Calif., and Uvalde, Tex.

Superintendent of the plant and warehouse at Phoenix (1042 North 21st Ave.) is F. J. Witt. Branch manager is George Davis. Dean Leedham is field service representative.

The company operates other dust plants in the West at Imperial, Whittier, Bakersfield (Seguro), Fresno, San Iose, Richmond, Santa Rosa and Sacramento, Calif.; Portland, Ore.; Wenatchee and Yakima, Wash.; Caldwell, Idaho; and Loveland, Colo.

Northwestern Glass Expands Output

Northwestern Glass Co., Seattle, has completed a \$200,000 expansion program to increase output of the plant by 30 percent, according to E. S. Campbell, president and general manager.

Northwestern has installed a second electric furnace, somewhat larger than the company's first electric unit having a capacity of 25 tons of glass daily. The second furnace is the third to be installed.

The first electric furnace was installed in 1945, and company officials consider it to be the only furnace of its kind for commercial production of glass containers.

Union to Compete

If present aims are realized, Union Oil Co. of California will have a new \$1-million asphalt plant operating next June in nearby competition with the plant that Stancal Asphalt Bitumuls has put into operation at Point Wells, Wash. Union's plant will be located at Edmonds, only a few miles north of the Stancal installation. Capacity of the plant is reported at 65,000 tons per year of paving asphalts, cutbacks and road oils. Construction by Bechtel Corp. was scheduled to begin this month. Heavy crude to feed the installation will be shipped by tanker from California.

Union's President Reese Taylor says, "The constantly growing activities in the Pacific Northwest in industry, irrigation projects and highway construction have made it necessary for the company to construct this new refinery in order to better serve the growing area."

Pioneer Produces Ceramic Granules

Pioneer Division of Flintkote Co. has installed equipment in its plant at Portland to manufacture colored ceramic granules for application to mineral surface shingles and other types of roofing. Pioneer, a producer of asphalt shingles, roofing and building paper and other construction materials, has previously obtained the granules from the Pioneer plant in Los Ángeles. The Portland plant, completed early in 1948, supplies the Pacific Northwest and Alaska.

At Portland, neutral colored base material for the granules is obtained locally. Ceramic glazes in 11 different colors are applied to the product, which is then fired in a rotary kiln designed by company engineers at Los Angeles.

Copra Plant Begins Operating

Tacoma Vegetable Oils, Inc., has put into operation at Tacoma its new \$500,000 plant for the manufacture of oil from Philippine copra. At present three expellers capable together of processing 100 tons of copra per day are installed, and foundations are in place for three additions instify.

Copra taken from ship by a clam bucket is discharged into automatic rotary weighing bins, then to storage prior to being ground. The ground product is fed into the expellers where it is heated to between 180 and 220 deg. F. The extracted oil is passed through filter presses before being pumped to tank cars or storage tanks.

Bureau Raises Zirconium Output

At Albany, Ore., the Northwest Electrodevelopment Laboratory of the U. S. Bureau of Mines has been expanding its pilot plant capacity to produce ductile zirconium and expects to have new facilities in production this month, with a total capacity of 1,000 lb. per week. The expansion was undertaken to meet urgent requirements for the metal by other federal agencies. Only one private company markets the ductile product.

The entire output at Albany is used for experimental purposes which are not disclosed because of security regulations. A statement from the Bureau of Mines issued this year: "The unusual refractory nature of certain zirconium compounds combined with the low neutron absorption of zirconium is suggestive of their possible application in nuclear energy pile construction and in stationary parts of jet engine and gas turbine combustion chambers."

parts of jet engine and gas turbine combustion chambers."

The bureau completed its first pilot plant at Albany early in 1947 with a capacity of 60 lb. weekly. The second, and present, pilot plant was completed in 1949 and was producing 500 lb. per week before the new plant was installed this fall.

Developed at the Albany laboratory, the electrochemical process as embodied in the new plant uses purchased zirconium chloride as the starting material. The chloride is placed in a steel reactor and sublimed to react with molten magnesium, thereby producing a mixture of metallic zirconium and magnesium chloride. The sponge metal, after having the magnesium chloride melted away at about 1,600 deg. F., is then melted in a graphite resistor furnace to produce the final metallic product. In the older pilot plants at Albany the starting material was zircon sand (oxides of zirconium and silicon) from the Oregon coast. The sand was heated in an arc furnace with graphite to produce zirconium carbide, which was then chlorinated in a silica-lined furnace to produce the zirconium chloride.

The Bureau of Mines has investigated the physical properties of zirconium alloyed with a number of metals, including aluminum, and its investigators consider that alloys with magnesium, iron, nickel and silver are among the most promising heat-resistant zirconium products.



Keekuk Making Ferrosilicon Again

Keokuk Electro-Metals Co. is again turning out ferrosilicon in its plant at Rock Island, Wash., after having the plant shut down most of last year for extensive redesign work costing about \$1.5 million. One of the furnaces is back in operation and another was ready to go into production a few weeks ago. A major change was made in the electrical equipment of the plant in order to make its electrical efficiency fulfill requirements for the plant's limited industrial power allocation from Bonneville Power Administration.

Ore for the operation comes from a company-owned mine in the Buckhorn mountains near Oroville, Wash., 23 mi. north of Rock Island. The main ore body was uncovered only last December after over a year of exploratory work. Previously, the plant obtained its ore from Canada at considerable transportation expense.

Ferrosilicon made at the plant goes to steel mills and foundries in California, Washington, Utah and Colorado. Vice president in charge of plant operations is L. E. Othmer.

UCLA Developing Western Ceramies

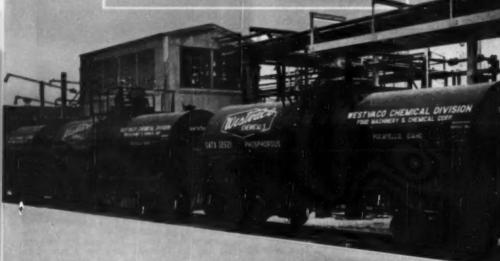
Improvements in ceramics engineering with emphasis on western minerals is the objective of a new division in the University of California at Los Angeles. William Knapp, formerly assistant professor of ceramics engineering in the school of mines and metallurgy, University of Missouri, has come to UCLA to become head of the ceramics program of the department of engineering.

In 1948, Hewett Wilson, now chief of the Southwest Region, U. S. Burcau of Mines, Norris, Tenn., came to California and made a survey of needs and potentialities of the ceramics industry in the state. The survey recommended establishment of a ceramics program by the University of California.

The upshot: about two years ago the university (Berkeley) began basic studies of ceramic raw materials and compositions. Today the ceramics group in the department of engineering at UCLA, under Dr. Knapp, is working toward practical applications.

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Alcoa Curtails Laterite Work

Alcoa Mining Co., an affiliate of Aluminum Co. of America, has, after five years of exploratory drilling for laterite in the northwestern Oregon counties of Washington and Columbia, curtailed its activities. Only a skeleton force will be maintained at the company's office and laboratory at Hillsboro, Ore. Alcoa has not indi-cated what the next move will be. Some years ago the company obtained large areas of land believed to contain laterite, with a view to extracting alumina from it.

An official of Alcoa's aluminum plant at Vancouver, Wash., says that although the laterite has been found much lower in alumina than even the lowest grades of bauxite used during the war, the material has an appreciable percentage of iron oxide, and through a process developed by the company for extraction of alumina it was hoped that a marketable iron also could be produced. It was contemplated that the production of alumina from the laterite would be limited to an amount that would correspond to the quantity of iron that could be disposed of, making up the deficiency in the supply of alumina by in-shipments of high grade bauxite.

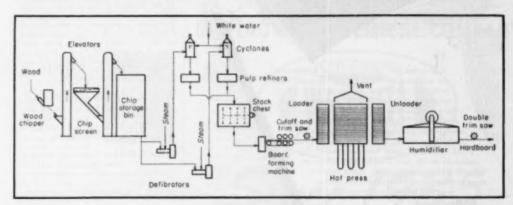
Oregon Paper Makers Win Belay

Four manufacturers of sulphite pulp and paper in Oregon have received an extension of time from the Oregon State Sanitary Authority in which to take steps to prevent sulphite waste from entering the Willamette and South Santiam rivers during specified low-water periods. The state agency had previously set December 1951 as the time after which wastes in quantities capable of pollution could not be discharged. The new deadline has been extended to May 1952.

Mills affected are those of Oregon Pulp and Paper Co. at Salem; Spaulding Pulp and Paper Co. at Newberg; Crown-Zellerbach Corp. at West Linn and Lebanon; and

Publishers Paper Co. at Oregon City.

The extension of time was authorized to give the mills more time to install such pollution prevention facilities as they find most practicable. At a hearing before the Oregon state agency earlier this year paper makers expressed the view that it was too early to decide upon the choice of ammonia or magnesia pulping as a basic method of preventing stream pollution, and favored the impounding of sulphite wastes during low-water periods.



Oregon Lumber to Make New Hardboard

Oregon Lumber Co., after several years of basic research, has decided to build at Dec, Ore., a plant to manufacture a new type of hardboard from Douglas fir slabwood, a waste product in the Pacific Northwest. The hardboard is basically new because it will be manufactured from run-of-mill waste that includes the bark. The natural waxes in the bark will furnish the necessary bonding and water-repelling qualities to the final product.

Blaw-Knox Construction Co., whose chemical plants division is general contractor for the plant at Dee, has also become licensor for use of the process. The engineeringconstruction firm estimates that the plant should be completed early next year. Daily capacity, on the basis of in. thick hardboard, is planned at 120,000 sq. ft.

Background information about the process, which has not been publicized, is interesting. Oregon Lumber Co. was advised that a new incinerator to dispose of its slabwood waste would cost around \$100,000. President A. C. Lighthall decided that the use of such waste, including the bark, might prove more profitable than burning, and he had some ideas as to why the bark ought to be used. Lighthall went into a huddle with his director of research, Dr. A. B. Anderson. The resulting research led to conclusions that countered a prevailing view that in the production of fiberboards, bark-free wood seemed mandatory and that extraneous binders had to be used in the final product. It was found that if Douglas fir bark is included with the wood, a board could be manufactured that is comparable to hardboards in which a binder is incorporated.

At the Dee plant it is expected that the average amount of bark in the total wood waste from the Oregon Lumber Co. mill will run about 35 percent. The percentage is not critical, as the experimental work showed that it could be varied roughly between 20 and 60 percent without material effect on the hardboard. The wax content in the dry bark ranges between 5 and 10 percent, depending on age of the bark and other factors. The slabwood is chipped and pulped with steam at about 100 psi; the pulp is formed on a continuous forming machine and hydraulically compressed into hardboard.

Dr. Anderson, following completion of his research work for Oregon Lumber Co., has become head of the new Forest Products Laboratory division of the School of Forestry, University of California at Berkeley. He and W. J. Runckel (the latter is still with the lumber company) presented a paper, "Utilization of Douglas Fir Bark in Hardboard," delivered before the annual meeting of the Forest Products Research Society at Portland, Ore., in June. The paper covers in detail the research work leading to the new hardboard process.



M. Wade Choute has become manager of California Spray-Chemical Corp.'s Santa Clara, Calif., district, with headquarters at 675 Emory St., San Jose, Calif. Choate, a native of Tennessee, joined the Bureau of Entomology and Plant Quarant



M. W. Choute

tine of the USDA in 1935 and worked in several states before resigning in 1945 to go into private industry in the Pacific Northwest. The Santa Clara district under his supervision covers the California counties of Contra Costa, Alameda, San Francisco, Santa Clara, Santa Cruz, San Benito, Monterey and Santa Barbara.

R. G. Follis, chairman of the board of Standard Oil Co. of California, and Reese Taylor, president of Union Oil Co. of California, have been named to the military requirements committee of the National Petroleum Council. Other newly named oil company officials are C. S. Jones, president of Richfield Oil Corp. (storage capacity committee); and Follis, Taylor and William M. Keck, Jr., Superior Oil Co., (steel requirements committee).

W. A. Newhoff, vice president of Union Oil Co. of California, has retired after more than 30 years of service, and has been succeeded by F. K. Caldwell, manager of the company's Northwest territory.

Russell R. Galloway has become sales manager of the building materials division, the Paraffine Companies, Inc., headquarters at San Francisco. Galloway has been in the building materials industry for 28 years.

Louis C. Ball is the newly apnointed assistant to General Manager Claude E. Harper, Kaiser Gvosum, a division of Kaiser Industries, Inc. A geologist, he joined Kaiser Gypsum in 1948 after several years with Kaiser Aluminum & Chemical Corp.



I. C. Ball

Ball is a graduate of the University of Nebraska, and is associated with the Office of Naval Research in the San Francisco Bay area.

Gordon Tongue, who has been vice president and general manager of Northwestern Portland Cement Co., Scattle, has become president and a member of the board of directors. He succeeds C. T. W. Hollister, who has resigned.

Gerald F. Twist, manager of Food Machinery & Chemical Corp. 5 Peerless Pump division, has been elected a vice president of the corporation.



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Halley Johnston is manager of the new regional office that United Pumps Division, United Iron Works, an Oakland, Calif., firm, has opened at Houston. He will also supervise the company's district offices at Tulsa, St. Louis and Denver. Prior



H. Johnston

to his new appointment Johnston was western district engineering-sales manager for United Centrifugal Pumps. He is a member of ASME.

A. R. Heron and A. B. Layton have been elected members of the board of directors of Crown Zellerbach Corp.

Meredith Littlefield, formerly sales coordinator in the San Francisco office of Ethyl Corp., has become manager of the western sales region and will be transferred to the western district offices at Los Angeles. He succeeds Sanford M. Wagner, new vice president in charge of sales, who has been transferred to New York City. Littlefield joined Ethyl Corp. in New York in 1929.

E. V. Watts, formerly production superintendent of the southern division of General Petroleum Corp., has been named southern division superintendent. An engineering graduate of California Institute of Technology, he ioined the company



E. V. Watts

Stearates

Palmitates

Okto-8's (2 othyl hussic acid)

in 1936 and a year later became an engineer at the company's Vernon, Calif., headquarters. He became production superintendent in 1949.

C. W. Clark, technical director of Lederle Laboratories Division, American Cyanamid Co., in San Francisco, has transferred his work in that capacity to Napa, Calif.

William L. Fields has become manager of Standard Oil Co. of California's district office in Salt Lake City, succeeding F. C. Eastman, who is retiring. Fields was previously assistant manager of the company's district office at Oakland, Calif.

L. D. Jurs, vice president, Tide Water Associated Oil Co., has retired from that capacity after about 40 years of service with the company.

Max Parkin has been transferred by Union Oil Co. of California from the company's refinery at Cut Bank, Mont., to the refinery at Los Angeles, where he is assistant superintendent of operating and treating.

Robert J. Grasley, chemical engineer, has become head of the technical staff of Resin Industries, Inc., at Santa Barbara, Calif., a company manufacturing vinyl and other rubber products.



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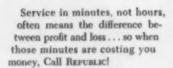
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FIRMS IN THE WEST





W. L. Nelson

P. Foste

Dow Chemical Co., Great Western Di vision, has set up in its San Francisco headquarters a technical service and development section. The manager is W. L. Nelson, previously manager of chemical sales. The function of the new section is to furnish technical services to the sales de partment and to handle sales development work in the West for all new chemicals produced by the Dow Chemical Co. Paul Foster, Ir., formerly assistant manager of chemical sales, has been promoted to the managership. Nelson, a chemical engineering graduate of the University of Minne sota, came to San Francisco from Dow Chemical's office in New York City in 1940. Foster, a chemist from the University of California, joined the company at the San Francisco office in 1946.

Pennsylvania Salt Manufacturing Co. of Washington is engaged in a construction program at its Portland, Ore., plant that may run to around \$200,000. One objective of the work is to furnish more storage capacity for chlorates to cope with seasonal requirements, and a similar expansion is contemplated for DDT storage. It is probable that capacity for evaporation of caustic soda will be increased somewhat to avoid the need of operating on a seven-day schedule. Additional space is being furnished for the caustic cell room.

Barium Products, Ltd., has reopened the Savercool barite mine in Plumas county Calif. The property has been idle since late in 1948, according to the California Department of Natural Resources, which says that the mineral is being moved by rail to the Barium Products plant at Modesto, Calif.

Sunnry Oil Co, will rebuild its crude topping and thermal cracking plant at Santa Maria, Calif., which was seriously crippled in a fire a few months ago. Involved in the reconstruction are facilities used for the fractionation of crude and the thermal unit where heavy residual oil was cracked.

Stauffer Chemical Co. has practically completed an extension to storage facilities at the company's superphosphate plant at Tacoma. The new building is designed to contain about 7,000 tons of superphosphate. Gamlen Chemical Co., manufacturer of industrial solvents and cleaners, is building an office structure at a three-acre manufacturing site in South San Francisco obtained last spring from United Air Lines. The new site will be used as an extension of the company's present plant capacity in San Francisco.

Continental Chemical Co., which recently leased portions of the government-owned war plant at Salem. One built to produce alumina from local clays (see PFI, May 1950) is now in the production of ammonium sulphate fertiliser at the rate of about 100 tons per day, all for local use. This output could be increased if more ammonia, which the plant does not manufacture, were available.

Alaska Chemical Co. has opened the first commercial acetylene manufacturing plant in Alaska, at Fairbanks. Generating capacity is 1,200 ft. per hr. Outlet for the product centers primarily in Fairbanks and Anchorage.

Bermite Powder Co., manufacturer of highway flares and railroad fuses near Sangus, Calif., suffered a fire last month estimated to amount to about \$200,000. Supposed cause was a spark dropped from processing equipment into strontium nitrate used in the products. The \$2.5-million property employs about 35 workers.

Leeds & Northrup, Philadelphia, manufacturer of electrical instruments and automatic controls, has opened a sales office in



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PENN SALT Progressive Chemistry for a Century

the Lloyd Building, Seattle, in charge of Stratford Biddle, Jr. The company has offices in San Francisco and Los Angeles.

DeVilhin Co., Toledo, Ohio, manufac turer of air compressors and equipment for spraying paint, plans to build a plant at Santa Clara, Calif, so an equipment assembly and distribution point. The company has leased an eight-acre site there.

Del Jack Co. is a new firm established at 214 North Canon Drive, Beverly Hills, Calif., to furnish equipment and supplies for chemical, metallurgical, food, pharmaceutical, fertilizer and other chemical process industries. Delbert E. Jack, who continues as West Coast Technical Advisor for Duriron Co., is manager.

Mutual Plywood Corp., whose plant has been under construction since 1948, has begun production of Douglas fir plywood at Eureka, Calif. Company officials say the plant is the second largest of its type in

Standard Oil Co. of California has begun construction in its Richmond, Calif., refinery of what is considered the largest vacuum flath unit in the world. The unit, having a height of 80 ft. and a maximum diam eter of 27 ft., is designed to charge 55,000 bbl. per day of reduced crude. Its purpose is to reduce the refinery output of heavy residual oil and at the same time to furnish a light distillate that can be cracked into motor fuels and other lighter prodLongview Fibre Co. expects to put into operation by next April an additional kraft paper machine that will increase the capacity of its Longview, Wash., plant by 40 percent.

United Centrifugal Pumps Division of United from Works, whose main office and plant are at Oakland, Calif., has opened an office at 225 Broadway, New York. John Re heads the New York office. United Iron Works has been planning also to open an office at Houston.

Ketchikan Pulp & Paper Co. is delaying construction of its projected high alpha pulp mill at Ketchikan, Alaska, until the relative advantages of the magnesium and ammouss pulping processes now under investigation by Weyerhaeuser Timber Co and Crown Zellerbach Corp. have been established. The Alaskan project is a joint venture of Puget Sound Pulp & Timber Co. and American Viscose Corp.

WESTERN LITERATURE

Chemical and Metallurgical Industries of the Pacific Northwest. This is a revision (June, 1950) of the original survey published in 1948 and later revised in Dec., 1948, by Raw Materials Survey, 701 Woodlark Bidg., Portland, Ore. The latest revision is an 11-pa. listing and is larger than the previous issue by the inclusion of primary manufacturers of fertilizers and fertilizer spikers. But cover names of companies, plant locations and products manufactured. Available from the agency named above. Chemical and Metallurgical Industries of

San Francisco Manufacturers Directory:
Part 4, Chemical Products. A 15-pe. listing (dated May, 1959 showing names of manufacturers and types of products. Includes primary chemicals, chemical specialities, medicinals, preservatives, pesticides, paints, solvents, etc. Territory covered is roughly within 50-ml. radius of San Francisco. Available from San Francisco Chamber of Commerce.

Tacoma Industries List. A 16-page classified listing of Tacoma manufacturers, giving names and addresses of industries arranged alphabetically under numbered commodity groups. Size of firms indicated by number of persons employed. Subject matter includes manufacturers of primary chemicals and related derivatives such as paints, fats and oils, fertilizers, medicinale, petroleum products, ceramics, glaze, etc. Published in March 1559, by Industrial Hureau, Tacoma Chamber of Commerce, Tacoma I, Wash.

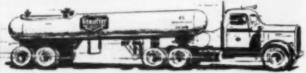
California Oil Fields, Vol. 25, No. 1. Published semi-annually by California Dept. of Natural Resources, Div. of Oil & Gas. of Natural Resources, Div. of Oil & Gas. of Natural Resources, Div. of Oil & Gas. of Natural Resources, Div. of Natural Resources, Div. of Natural Resources, Div. of Natural Resources, Div. of Oil & Gas. fornia Dept. of Oil & Gas.



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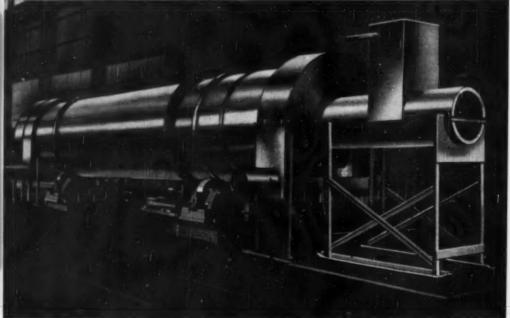
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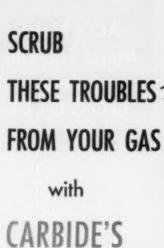
you can rest assured that its design has already been proven by many efficient installations. Miles of Traylor Rotary Dryers, Kilns and Coolers in use all over the world testify to Traylor's skill in designing and building rotary equipment that's right for the job. If you have a drying problem, contact Traylor today.



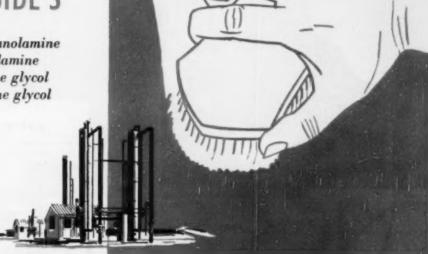
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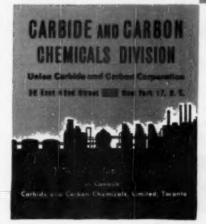
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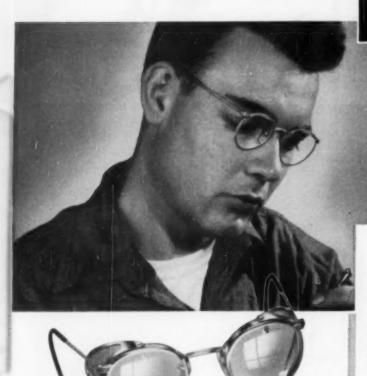
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With the introduction of the F4100 Metal Ful-Vue, AO's protection against the impact of flying particles reaches its highest development. Here in one goggle, with or without side shields, workers can obtain the peace of mind which comes from assured safety... the

utmost in comfort over nose and temples . . . the very finest in EYE APPEAL PLUS EYE PROTECTION:

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QUICK FACTS

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NEW RUGGED ENDPIECE—Streamlined... with a wide bearing surface at hinge which minimizes temple drop. Screw heads are countersunk and flush with endpieces for added good looks, non-agging security.

NEW LIGHTWEIGHT TEMPLE—Oval temples instead of round for greater comfort and attractiveness. Easily adjusted, perspiration proof. Insulated semi or half tubing in mother appearance improver and will outlast life of the temple. Tubing will not come off and it can't be discolored by dirt or grease. Both the temple and endpiece screws are AO patented "Ever-tite" construction . . . they keep tight in service yet remove quickly when replacing lenses.

IMPROVED GUARD ARMS AND BRIDGE— Guard Arms are newly shaped—longer with more opening for added ease of adjustment. The bridge is double braced with four contact joints—a feature found only in AO Ful-Vue spectacle goggles.

NEW SIDE SHIELD CONSTRUCTION — A real time saver . . . new one-piece binder and eyewire construction eliminates necessity of inserting the screen before inserting lenses! Replacement of lenses can now be made without any interference with or from the side shield. For these and many other reasons, be sure to see the new F4100, TOUR NEAR EST AO SAFETY REPRESENTATIVE CAN SUPPLY YOU.



IDENTIFICATION DISC: An aluminum marking plate on all Walworth No. 2239's facilitates inventory control and makes reordering quick and positive.



NEWLY DESIGNED HANDWHEEL Parented pir-cooled, flager-fit handwheel affords sore pript even with greasy gloves.



EMPROVED PACKING: Molded packing of lubricated asbestas reinfarced with copper wire. Suitable for practically every service. Valves can be repacked under pressure when fully accord.



take a good look at the Walworth 500 Brinell' no. 225P Globe

- the Toughest Bronze Valve Your Money Can Buy

The stainless steel, corrosion resistant seats and discs are heat treated to a hardness of 500 Brinell — hard enough to scratch glass and crush nails! The valve can be closed on sand, slag, and pipe scale without injury to the seating surfaces. "Wire drawing" is practically eliminated. All parts are accurately machined and gaged. Years of tight, positive shut-off are assured.

Available in both globe and angle types (angle type: No. 277P) in sizes 1/4" to 2", this quality valve is recommended for 350 lbs. W.S.P. at 550 F, and 1000 lbs. non-shock service on cold water, oil, gas, or air.

For full data on this long-life, economical Walworth Bronze Valve, see your local Walworth distributor, or write for Circular.





CONNECTION, DEEP STUFFING
BOX AND RUGGED STUFFING
NUT: Unlow benzet connection
of inninotes only choice of distortion or leadcase even though valve is repeatedly taken



SEATS AND DISCS: Plug type seats and discs of steinfess steel, heart-rearied to 500 Brisoti hardness and machined simultaneoutly to a mirror-tike fields, with occurrete



EXTRA STRONG BODY: Made of Composition M (ASTM B61) bronze. Thick walls and rugged hases provide a high safety factor. Valves undergo hydrostotic shell test of 1,000 psi.



DISTRIBUTORS THE PRINCIPAL CENTERS THROUGHOUT THE WORLD

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THIS <u>ONE</u> VALVE DOES <u>TWO</u> JOBS WELL CRANE ALLOY PLUG GATE

IN CRANE 18-8 MO OR MONEL

Use this valve as a gate or as a globe—you'll get top performance in either service. The flow-lift curves, at right, prove it. In wide open position, flow through a Crane Plug Gate equals that of a wedge gate valve. In throttling service at high velocity, Crane Plug Gates operate with the same efficiency as conventional plug type globes.

In addition to their dual utility, these valves combine highest resistance to corrosion and product contamination. Made in two materials, all parts in contact with flow are either finest quality Crane 18-8 Mo Stainless Steel or Monel. Note these typical outstanding features.

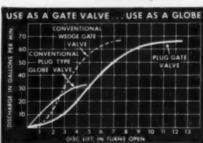
- CIRCULAR PLUG DISC resists cutting action of fluid on seating surfaces. Disc does not turn with stem, thus reducing seating surface wear.
- ACCURATELY MACHINED SEATS—Disc and body seats are machined to same taper. True disc alignment and tight seating assured on every closure.
- **EXTRA DEEP STUFFING BOX** holds ample packing. Hinged gland bolts provide easy access for repacking.
- TIGHT, SAFE SONNET JOINT—Male and female bolted joint fully retains gasket. Four bonnet bolts distribute bolting load evenly.
- OUTSIDE SCREW AND YOKE DISIGN—Stem threads are out of contact with line fluids. Thread lubrication is easier. Rising stem indicates position of disc.

SEND FOR CIRCULAR NO.320 for full information about Crane Plug Gates and other Crane corrosion-resistant piping materials. Ask your Crane Representative for your copy, or write direct. No obligation.



CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill. Branches and Wholesalers Serving All Industrial Areas

No. 18851 and No. 17751 Plug Gale
Working Pressure: 150 pounds
liquid or gas; 350° F. max. temp.
Sizes: ½ to 2-in.
Screwad or flanged ends.

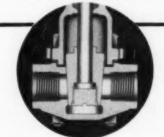


Flow Lift Curve for 1-inch Plug Gate Valve, Conventional Wedge Gate Valve, and Conventional Plug Type Globe Valve

NO STICKING . . . HOT OR COLD

Circular supered disc and precisely matched curvature of body sents prevent sticking of disc—even when valve is closed while hat and apened when cold. Galling conditions, commanly encountered in small allay wedge gates, are minimized.

Note the straight-through parts of maximum diameter; and the simplified, strong disc-stem connection which prevents tipping of the disc.



EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES . FITTINGS . PIPE . PLUMBING AND HEATING



THE JOB is dewatering a high grade pigment of 1½ to 2 micron size.

THE BIRD takes the feed containing about 9% suspended solids and at 70 to 80°C. and delivers the solids at exactly the right consistency to pre-form and distribute on an apron type thermal dryer.

The filtering operation is totally enclosed.

The product comes clean.

Recovery of high priced product is 99.9% plus.

Labor cost is cut way down.

Contrast this with the batch method previously used to produce a poorer quality product, far less of it per day, with heavy shrinkage losses and heavy labor cost. The BIRD quickly pays for itself.



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The Bird Rassarch and Development Cancer is equipped in provide prompt and positive devectors of actual performance. The proofidition for productive replacement of your old filtration markeds are too providing to past up. Get in much with

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BUSINESS IN MOTION

To our Colleagues in American Business ...

• Quite a number of years ago Revere coined the phrase "Bubbles have teeth." This refers to the fact that what is called air entrainment is highly damaging to condenser tubes. Bubbles carried along with the cooling water set up a strong disturbance in it, disrupting the film that should protect the metal, and actually seeming to eat away the tube. The oxygen contained in the air bubbles also is detructive. Fortunately, the effects of air entrainment on condenser tubes are sufficiently distinctive to permit Revere Research to detect the trouble by

examination of short lengths cut from tubes that have failed before their time.

Thus it happens that every once in a while the Research Department in Rome, New York, working through the Technical Advisory Service, is able to say that there is air leaking into a condenser it has never been, in a far-off state. The problem then is to seal the water system against the entrance of air. This is not always an easy task, and it is one that the

Revere Technical Advisory Service is glad to tackle together with the customer if asked to do so. After all, we want our condenser tubes to last as long as possible; that's what makes customers happy, and builds and preserves our reputation as producers of fine tubes.

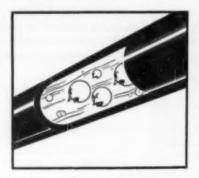
In one such instance of bubble trouble, the operator, a public utility, could find no visible sign of a leak. Checking and tightening every bolt and seal produced no results. Finally it was decided to put plate glass windows in some of the inspection plates, in order to see what was going on inside. This located the defect, a stream of bubbles being easily seen pouring out of a gasket. The water was flowing past that gasket with sufficient velocity to suck air in, and was moving too fast to leak out.

In another instance, a few samples of failed tubes from an oil refinery (located almost 3,000 miles away from the utility) were sent to Revere's Research Department. The refiner was told that his trouble was due to bubbles. Again, a check of the condenser showed nothing. The water inlet and outlet lines and all gaskets and bolts seemed to be per-

fectly tight. Here was another puzzler. But once again it seemed plausible to assume that air was being drawn in where water velocity was high enough to create a suction. The search finally went all the way back to the water pumping station, where two cracked castings were located. Air sucked in through two tiny cracks was enough to do a lot of damage; bubbles do indeed have teeth.

You can see that Revere wants its customers to be satis-

fied, and to that end sometimes goes to great lengths to look into conditions for which it may be in no way responsible. This attitude is typical of American business; every company rightly regards the satisfied customer as a precious asset, the source of orders that support the business and its employees. Therefore it is suggested that if any product you buy for use in your business is not completely satisfactory, let the supplier know, even if you are sure the trouble is not his fault. He will be glad to cooperate with you in a search for satisfaction.



REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

* * *

Executive Offices: 230 Park Avenue, New York 17, N. Y.



Top illustration: 12" diameter Helicoid (screw) Conveyor delivering screened mixed clay to four 12" diameter reversible Helicoid Conveyors discharging into 16 batch bins. Lower illustration: Hydrated lime from bottom of reserve storage silo being conveyed to bucket elevator by Link-Belt Helicoid (screw) Conveyor.

LINK-BELT COMPANY

Chicago 9, Indianopolis 6, Philadelphia 40, Atlanta, Wouston 1, Minneapolis 5, Sax Francisca 24, Los Angeles 33, Seattle 4, Torento 8, Johannesburg. Offices in Principal Cities.

11,074

Link-Belt originated and is the largest producer of continuous rolled Helicoid (screw) conveyor. Link-Belt also manufactures many other types of screw conveyors, including sectional flight, in a wide range of diameters and gauges, and in various metals, including stainless steel for conveying jobs where a sanitary metal is desirable. All necessary components such as collars, couplings, hangers, troughs, box ends, flanges, thrusts, drives, etc., are also available to give you one source of supply.

Link-Belt screw conveyors are compact, occupying less space than many other types of conveyors and therefore can be adapted to close clearance locations. Loading is simple—thru spouts or from adjacent conveying mediums. Covers and joints are tight, and dust seals and spring cover clamps keep dirt out, dust inside. Installation and operating costs are low.

Link-Belt engineers will be pleased to study your conveying problem and recommend a conveyor to suit your specific needs. Contact our nearest office for unbiased recommendations.



A Headline that is also a Helpline.

- BUFLOVAK'S RESEARCH
- 2 Is maintained for your use...
- 3 To enable you to pre-test your contemplated process...
- 4 And get complete results and production data
- So that you know . . . even before you start, if
- to profits
- BUFLOVAK Research and Testing Laboratory is a complete processing plant, equipped with both small scale experimental units and semiplant equipment of new and advanced designs.
- 2 Maintained for your use, it can help you solve problems in drying, evaporation, extraction, selvent recovery, crystollization, and food processing.
- 3 Here tests can be completed, ranging from a few beakers of precious materials to tank car quantities requiring round-the-clock operation on a production scale.
- Results are definite and production data accurate. Over 6500 processing problems have been completed since the Laboratory was started in 1907. It's a combination of "know how," experience and equipment that brings up the right answers.
- 5 Many new methods highly profitable to their users have been developed, such as, low temperature drying and evaporation. You, too, can get the right answer before you start.
- 6 Your investment in BUFLOVAK Equipment is safeguarded by pre-testing your product. That proves at the start whether you are on the right track to profits.

low the performed on this realized type product. It performed on this realized type Mainteen Steel Vurpour Devicto Brian Briter material in the BUPLGVAN Laboratory.



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a double economy advantage: First, by providing lower cost, lighter weight corrosion-resistant fittings and lines; and Second, by providing one dependable source of supply for all types of fittings to meet all of your plant requirements.

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For the best cost-reducing solution to your corresive problems, let Tri-Clover recommend the correct fitting type to do the job.

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FABRICATED STAINLESS STEEL INDUSTRIAL PITTINGS AND INDUSTRIAL PUMPS

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Conical End FITTINGS.

Stainless Steel type 316, full range of

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in Stainless Steel types 304, 347, 316.

Recessed End FITTINGS

plete range of fitting types, in sizes from %" thru 24", for soldering, brazing or socket welding.

CHEMICO

announces

A NEW WAY

to make

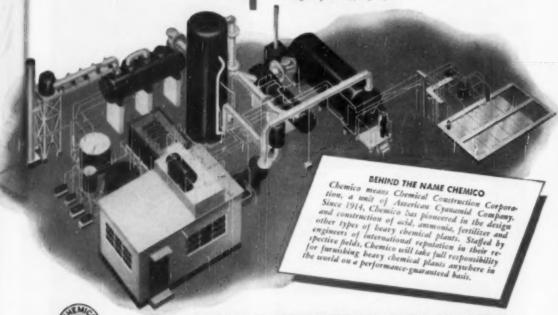
Sulfwic Acid Whether you make or buy sulfuric acid, this simple new-type Chemico plant will be of special interest to you. Here's why . . .

Chemico's new process for manufacturing sulfuric acid from sulfur makes it possible for you to replace or enlarge your present facilities at considerably less cost than for the standard type contact plant.

The simplicity of this new Chemico plant is the basic reason for its low cost. These seven major items of equipment — usually found in present-type contact acid plants — have been eliminated: drying tower, gas filter, heat exchanger, SO₂ cooler, acid coolers, acid circulating and transfer pumps, and diluting equipment. In addition, the distinctive features listed below assure more efficient production.

DISTINCTIVE FRATURES

- A quench converter eliminates heat exchangers... assures higher yield from raw sulfur... virtually eliminates atmospheric contamination due to unconverted SO₂.
- A multiple-stage dip-pipe absorption system, operating by gravity flow, eliminates the need to distribute acid over packed absorbing towers.
- Water evaporation from absorber acid solutions removes heat of absorption and the sensible heat of the hot gases.
 Only the product acid requires cooling before storage.
- A built-in Pease-Anthony Venturi Scrubber insures mist elimination in the exhaust stack.
- \bullet Plants of this new type deliver sulfuric acid of any strength up to 95% $H_2SO_4.$



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ALOYCO 20...

for valves in sulfuric acid service!

Aloyco 20 is frequently referred to as a super corrosion-resistant alloy. This is due to its unequalled resistance to hot and cold sulfuric acid in various concentrations, as well as to many other acids.

Valves are manufactured in Aloyco 20 in a complete range of types and sizes, screwed and flanged ends, in 150, 300 and 600 lb. pressure classes. Illustrated are a few of the more popular valves that are used in great numbers by plants producing materials such as fertilizers, plastics, rayon, soap, synthetic rubber, explosives, coal tar and oil refinery products. In short—Aloyco 20 valves have an application wherever Sulfuric Acid is used.

Aloyco 20 is practically unaffected in any concentration of H_2SO_4 at room temperatures. It is also adequately resistant at the boiling point up to 30% acid strength. In concentrations between 30% and 93%, temperature is an influencing factor. Aloyco 20 is also strongly resistant to the effects of high strength sodium hydroxide, hot acetic acid, acetic anhydride vapors and hot nitric-sulfuric solutions.

Our metallurgists will gladly confer with you regarding the application of Aloyco 20 and the many other Aloyco corrosion-resistant alloys—to assure your using the one best alloy to meet your particular requirements.



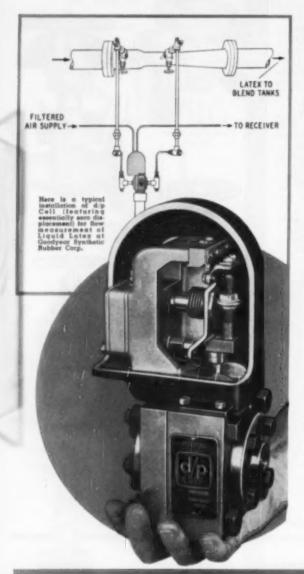
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1301 W. ELIZABETH AVE., LINGEN. NEW JERSEY

ATLANTA - CMCAGO - HOUSTON - LOS ANGELES NEW YORK - PITTSBURGH - WILMINGTON

NOW - measure flow of viscous or corrosive fluids without seal pots





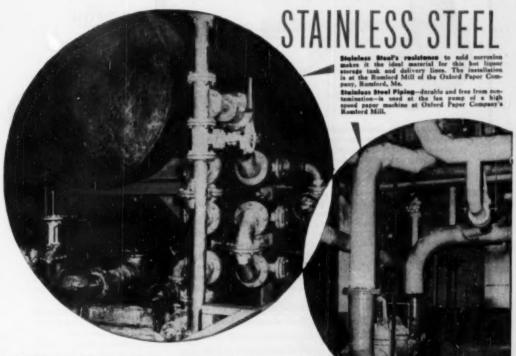
You can cross seal pot troubles right off your list when you measure the flow of viscous or corrosive liquids with a Foxboro d/p Cell (differential pressure pneumatic transmitter). Goodyear did it very successfully on one of the toughest jobs . . . the control of latex flow to a coagulator. Here are the results obtained by this leading manufacturer through the use of the mercuryless d/p Cell:

- A. 83% reduction of instrument cleaning and maintenance costs.
- No unscheduled production shut-downs for instrument maintenance.
- C. Estimated savings over previous flow measuring system will return cost of d/p Cell installation in approximately 1 year.

These cost-saving achievements were made possible by the elimination of seal pot disadvantages . . . (frequent and time-consuming clean-outs, constant risk of clogging, instrument inaccuracies, etc.). A complete "Technical Report on Savings Effected at Goodyear Synthetic Rubber Corporation through Control of Latex Flow by d/p Cell" is available. Send for a copy and details of the unique d/p Cell. The Foxboro Company, 248 Neponset Ave., Foxboro, Mass., U. S. A.

d/p CELL for better flow measurement

PIPE and TUBING that carry corresive liquids



THE broad application of Stainless
Steel often has been called one of
the most important developments in
the field of pulp and paper mill materials. And nowhere have the benefits
of Stainless been more important than
in heat exchangers, evaporators, white
water and liquor lines, and other applications of Stainless Pipe and Tubing.

A large Western mill, for example, found that less durable materials in the first effect of their evaporators lasted only three to six months. But tubing of U.S.S 18-8 Stainless Steel was still in service, apparently untouched by corrosion, eight years after installation.

Stainless Steel's exceptional resistance to acid corrosion and resulting long life shows up quickly in reduced production costs. And there's no problem of contamination and discoloration when stock and white water lines are Stainless Steel.

Stainless Steel in the form of strip, sheets, plates, bars and wire plays equally important roles in hundreds of paper mill applications. Wherever used, the ability of this aristocrat of metals to reduce corrosion losses, to resist wear and abrasion, to withstand extremes of temperature pays off in a better product and reduced maintenance costs.

And for best performance from Stainless equipment, be sure that you use U.S.S Stainless Steel. In U.S.S Stainless, every form is available in a wide range of sizes, analyses and finishes each a perfected, service-tested material, specifically designed for the job assigned.

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SHEETS - STRIP - PLATES - BARS - BILLETS - PIPE - TUBES - WIRE - SPECIAL SECTIONS

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UNITED STATES STEEL

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PROJECT: To provide economical, efficient, automatic weighing of chlorimated hydrocarbons used in production of a high-purity plastic. Discoloration and other contamination of chemicals must be prevented. To maintain their stability, they must be kept at sub-zero temperatures.

DESIGN: Jacketed weigh tanks on suspended scales.

Inner tank shell of Lukens Nickel-Clad Steel;
outer tank shell of carbon steel, externally
insulated. Circulation of coolant provided for by passage
between shells. Fast, uniform heat transfer assured by nickel-clad
steel walls. Resistance to chemical attack and prevention of metallic pick-up provided by nickel interior of inner tank; strength and
rigidity, by its steel backing.

END RESULT: Fast, accurate, automatic weighing of stable, pure, colortrue chemicals. Easy, low-cost maintenance. Long equipment life.

These benefits are typical of results achieved with newly developed, more efficient processing equipment. And wherever design, fabrication and materials selection must be critically coordinated, you will find the economical answer in applied Lukenomics. Lukenomics combines the experience of designers, engineers and equipment builders with Lukens' knowledge of materials and their application, gained over 140 years as the world's leading producer of specialty steel plates, heads and steel plate shapes.

It's sound investment insurance to put Lukenomics to work on your equipment problems. There are progressive fabricators who can do this for you. Get in touch with them or write our Manager of Marketing Service, stating your problem. There's a Lukenomics team ready to go to work on it. Lukens Steel Company, 400 Lukens Building, Coatesville, Pa.





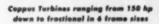
LUKENS STEEL COMPANY

The above weigh tanks, designed and used by a nationally-known chemical company, were fabricated by The Ohio Machine and Boiler Co., using Lukens Nisch-Clad Steel.

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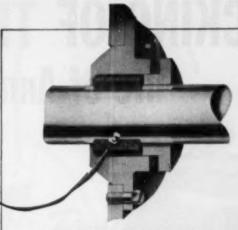
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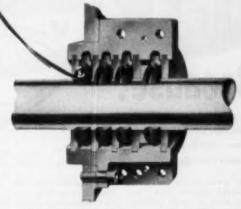


WRITE FOR BULLETIN 135

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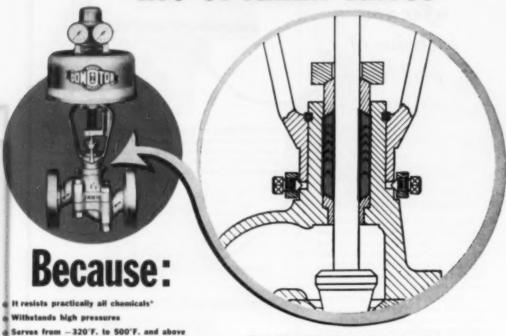
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To provide long service efficiency with minimum upkeep cost, the Annin Company supplies packing rings of Du Pont "Teffon" as standard equipment on almost all of its valves.

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They've found that packing of "Teflon" tetrafluoroethylene resin will last as long as the valve itself. It has the strength to withstand high pressures, is unaffected by the most corrosive acids. In fact, there is no known solvent for "Teflon." Actual

field applications have proved its service range from as low as -320°F. to temperatures above 500°F.

"Tefon" has a low coefficient of priction—usually needs no lubrication, provides a non-sticking, bubbletight seal. Low friction on the stem allows the valve to operate more easily at a given pressure. All of these features combine to provide long life, trouble-free service from the packing, and to save labor, material and production downtime costs. Regardless of pressure, temperature or materials being handled, the packing rarely requires even the simplest servicing!

"Teflon" is supplied by Du Pont as molding powder, suspensoid, and tape. We will gladly recommend molders or fabricators who can supply finished parts of "Teflon."

"TIFLOH" packing molded in form of "V" rings by Crane Packing, Chicago, Ill. Value shown made by The Annin Co., Les Angeles, Calif.

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Fourteen years ago The Carborundum Company began the production of "Monofrax" fused cast refractories, containing alumina in amounts ranging from 82 per cent to 95 per cent. Since then several thousand tons of these refractories have been used in more than 50 complete glass-tank installations throughout the world.

These installations have brought out the money-saving characteristics of high alumina-content refractories. For example, high resistance to corrosion and upward drilling at both borizontal and vertical joints has been an outstanding characteristic. In general the experience gained from these installations has definitely proved the superiority of aluminacontent refractories.

ALCOA Alumina is used in "Mono-

frax" H and MH compositions, because it gives refractories chemical inertness, high strength and stability under load at high temperature and resistance to spalling and cracking. Porosity and shrinkage are negligible.

These characteristics result in longer refractory life and fewer teardowns. That's why alumina-content refractories are so economical in the long run. In addition, the uniform purity of ALCOA Alumina helps the refractory manufacturer maintain a high standard of dependable performance.

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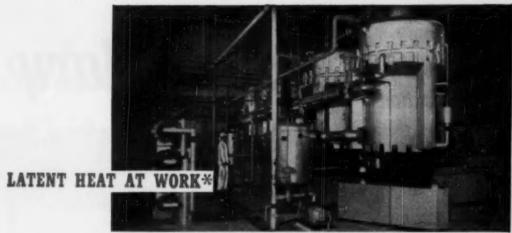
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Cleaver-Brooks Compression Stills offer Exceptional Economy in 3 Basic Applications:

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Compression Stills recover valuable solids from fluid wastes from tanning liquors, brine,
amino acids, penicillin slurry, black liquor from pulp-paper mills, other solutions and substances.

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Cleaver-Brooks Compression Stills are available in standard size units from 75 G.P.H. to 2100 G.P.H., electric or Diesel drive. Larger sizes to fit specific applications can be constructed for field erection. Write for bulletin "Compression Distillation". CLEAVER - BROOKS COMPANY, 331 E. Keefe Avenue, Milwaukee 12, Wisconsin

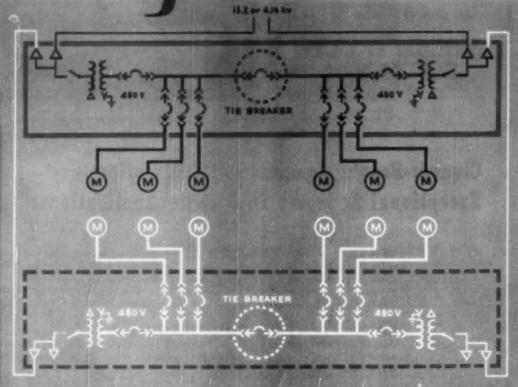


The merit of compression distillation lies in the efficiency with which latent heat is consantly being reclaimed and utilized—recycling through the evaporator.



What's the trend in chemical plant electrification?

secondary



As this one-line diagram shows, the heart of a secondary sales five system is a deuble-ended unit substation or a pair of single ended unit substations with a normally-open file circuit breaks between the Mats have confer to written in amounted by add ing mare units, either ringle-ended or deuble-ended (as shown in visite) without requiring new recondary writingsor on existing units. The source of the 450-vell system may be prounded for greater contain enterlainty. Increased series, and lever-cost exercises.

Here's what you need to modernize your power system!

WHEN YOU COME TO GENERAL ELECTRIC you get far more than the finest in electrical equipment. A General Electric application engineer, familiar with chemical plant practices, is at your disposal. If desired, he stands ready to assist you in co-ordinating all the needed components, engineering your power distribution into one modern, efficient system.

selective distribution systems

WITH UNIT SUBSTATIONS

—to protect continuity of service at minimum cost

What's behind the growing industry practice of distributing power through secondary selective systems? Primarily it's recognition of the fact that for most plants it provides a simple, lowcost way to safeguard service continuity for operations requiring uninterrupted production.

This method utilizes a normally-open tie circuit breaker between the secondaries of two transformers in a double-ended unit substation. The tie provides an alternate source of power for secondary circuits if either transformer becomes de-energized by a fault in the primary circuit.

In effect, it enables one "partner" when necessary to carry the essential load.

Simplicity is another advantage of this system. Operating personnel need no special training to operate and maintain the equipment contained in a double-ended unit substation—chiefly transformers and manually-operated drawout air circuit breakers.

Moreover, expansion is easy and economical. Single-ended or double-ended substations can be added at will. Since no added interrupting duty is imposed, no new secondary switchgear is needed on existing units. Full data is contained in Bulletin GET-1438, "Secondary Networks for Industrial Plants." Send for your copy today. Apparatus Dept., General Electric Company, Schenectady 5, N. Y.



TO HELP CUT YOUR POWER DISTRIBUTION COSTS... Don't miss seeing the "More Power to America" full color and sound slide-film "Modern Industrial Power Distribution." It's packed with helpful, cost-cutting ideas you can use. Ask your G-E representative to arrange a showing for your organization.

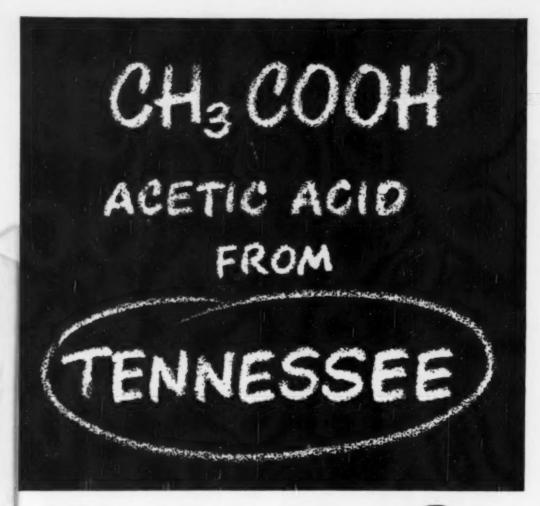


G.E double-ended lead-center unit substations for nonhazardous areas are compact, factory-assembled "packages." Shipped ready to install, they are furnished in flexible combinations of incoming-line and secondary-circuit arrangements with transformers from 100 to 2000 kvs.



For semi-hezardous areas, G.E doubte-ended load-center unit substations have easily removable air circuit breakers, each in Class I, Group D endouvers, plus primary power circuit breaker, a standard Pyranol ® transformer section, and a secondary bus acclaure.





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TROUBLE IS RULED OUT! Check these 16 advanced features-for wearresistance . . . for ease of maintenance. From handwheel to diaphragm, notice how thoroughly trouble has been ruled out in designing this U-bolt valve. No other valve in its class measures up to Jenkins U-bolt Gate on all these points, many of them exclusive.

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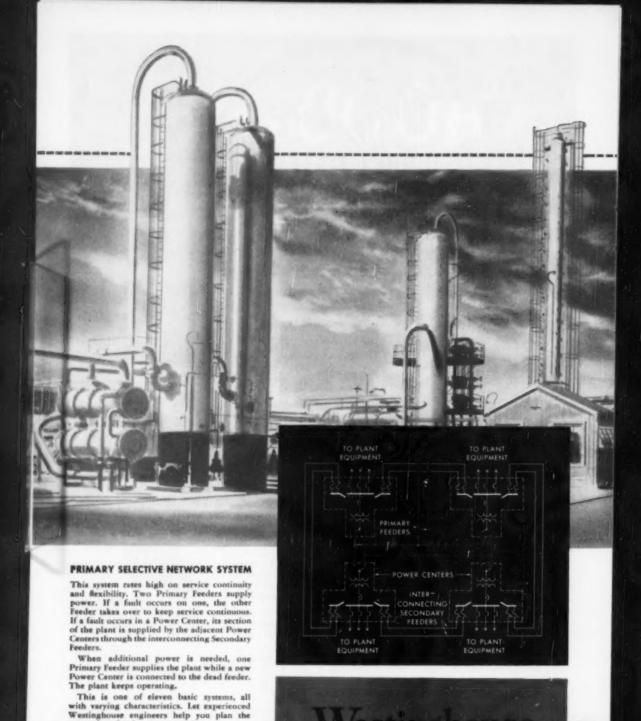
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in the U-balt not was fi





system best fitted to year operations.

EQUIPMENT FOR THE CHEMICAL INDUSTRY



Westinghouse

HOW MUCH DOES IT COST

when a distilling column goes "down"?

Probably more than you care to think about. But when power failure is at fault this costly threat can be eliminated. The answer:

A planned power distribution system!

When you modernize existing plants or build new ones, plan a system that insures service continuity... that gives you alternate power routes when electrical troubles occur. Moreover, make sure the system will be flexible... to permit load shifts and allow expansion without shutdown.

The Primary Selective Network shown on the opposite page is an example of a system that gives you this important service continuity and flexibility. But this is just one of the many systems you'll want to consider. Each has specific advantages depending on your particular operation. And Westinghouse can help you and your plant contractor design the system that best fits your requirements.

To help you make preliminary decisions we've prepared informative material covering all systems. Write for yours now. And remember, when you're building or modernizing, call in your Westinghouse engineers. With wide experience in power problems they can help you plan the one best system for your particular operation.

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"Industrial Plant Distribution Systems": 34 fact-filled pages completely explain the eleven basic systems. Ask for B-4045.

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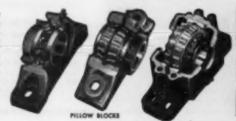
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NO. 9

SEPTEMBER, 1950

What Are the Fields of Application for Super Refractories?

Super refractories by CARBORUNDUM have been used with excellent results in a wide range of industrial kilns and furnaces and for certain other specialized applications. They have demonstrated that, wherever refractories are used, it is possible that super refractories may be profitably adapted to specific areas of recommended usage.

However, in spite of their wide range of use, there is no pat formula for application — each new installation must be considered individually. Service requirements vary so between units, that even comparable furnaces may develop conditions demanding the use of different super refractories. Ac-

tual selection of super refractories can be based only on the specific operating conditions involved.

The field of application for super refractories is limited only by the economic justification of their cost. In some installations they are used to implement other refractories to improve overall life. In still other cases they may completely replace common refractories to increase production, improve quality of work and even make new processes possible.

At the right are some of the applications in which their special properties are used to good advantage.

Physical Properties of Super Refracturies by CARBORGHOUNG							
	CARBOFRAX Prime Carbbe	MULLIFRAX Charin France	MILLIPIAX S	AUTEAX E	ALFRAX B	HING II	
Heart Conductivity at 1200° F, in 870/ for, eq. ft. and °F. /in, of thickness	109 BTU	16 BTD	7 819	24 9TU	12 800	7 MW	
REPRACTORINESS PCE COME	37-40	30-29	37-28	37-39	27-40	26-27	
SPALLING RESISTANCE	24	N/A	Mgh	Good	Good	Gord	
AGRASION RESISTANCE	Mah	Median	Medica	Nigh	Mades	Low	
THERMAL EXPANSION [25" — 1400" [.]	.0000044	.0000039	,0000049	.0000074	.000004	,Accord	
HODINES OF HOPTURE 240° F. FSI	800-3125	100-258	175-475	100-1050	100-225	54-100	
WEIGHT F IN. STRAIGHT	9.25 Ba.	1 lbs.	A Sec	10.1 lbs.	7.25 Ba.	48	

Some of the Applications For Super Refractories

Acetylene manufacturing furnaces Activated carbon retarts Air furnaces Aluminum malting furnaces Annealing furnaces Assay furnaces Boking ovens Billet heating furnoces Boiler settings Bone char revivillation furnoces Brass melting furnaces Butadiene manufacturing furnaces Codmium reterts Carbon brush furnaces Carbon black furnaces Carbon monoside furnaces Corbon diaside furnaces Carburising furneces Coment kilns Coromic kilns Coal gas benches Cabalt retarts Copper melting and refining furnaces Crucible melting furnaces Flactric furnaces Enamel frit furnaces Forging furnaces Gos producers Gas generators Glass tanks Glass labre Gold smelting furnaces Heat treating furnaces Hydrocarbon cracking furnaces Hydrogen manufacturing furneces Incinerators Ladies Lime kilns Lithopone kilns Mallooble annualing furnaces Magnesium reduction furnaces Muffle furnaces Muriatic acid furnaces Oil refining stills Oleum manufacturing furnaces Open hearth furnoces Phosphate furnaces Porcelain engmeling furnaces Pottary kilos Recuperators Regenerators Reheating furnaces Retorts Reverberatory furneces Rock wool furnaces Rotary kilns Slag wool furnoces Smalting furnaces Soaking pits Styrene manufacturing furnaces Sulphur burners Tunnal kilns Vornish fires Welding furneces Zinc distillation Zinc refining Zinc retorts

"Carborundum.""Carbofrax," "Mullfrax," "Silfrax," "Alfrax" are registered trademarks which indicate manu acture by The Carborundum Company

Address all correspondence to: Dept. H-90, THE CARBORUNDUM COMPANY, Refractories Division, Perth Amboy, New Jersey

Continued an other side

Water Gas Generators — Another Super Refractory Application



Four principal benefits result when user gas generators are equipped with CARBOFRAX silicon carbide linings; 1. Foster and Easier Cleaning: Clink-

2. Increased set capacity: Shorter cleaning time means units are on the line longer. They stay hotter — get back into production faster. The entire grate and fire area stay clear of clinkers longer. This results in better fuel combustion and increased gas-make.

3. Longer lining life: A service life usually 3, 5 or more times that of ordinary linings. CARBOFRAX brick have high resistance to flame erosion spalling, cracking and mechanical abrasion.

4. Lower operating costs: Repeated repairs and replacements are eliminated. Shorter cleaning periods mean further savings.

ers do not become embedded in the hard brickwork. Barring off is faster, easier and more complete. Cleaning time is reduced 30 to 50%.

The characteristics of CARBOFRAX refractories which have made the foregoing results possible also are used advantageously in producing blue gas and oil gas. These refractories are likewise employed for new gas making and reforming processes.



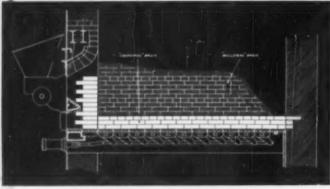
Super Refractory Ideal for Kiln Furniture

This picture of a vitrified hotel china kiln car superstructure was taken after 80 trips — with no rebuilding. Notice the straight, level CARBOFRAX silicon carbide setter tile. Note, too, the excellent condition of the CARBOFRAX I-beam posts despite the heavy loads carried. Also of interest is the fill obtained with this design of setting.

CARBOFRAX setters with their high hot strength minimize warpage. They stay clean — there is no boiling or blistering. Their unique thermal shock resistance minimizes cracking.

High density and refractoriness of the CARBOFRAX I-beam posts prevent "squatting," "Cornering" also is eliminated. Post life is extended to cut replacement cost and frequency of rebuilds. With a relatively thin web and smaller pads these posts make ware placing easier and faster — increase car pay-load.

Put to work as kiln furniture for various operations, CARBOFRAX setters and posts result in definite economies per piece or per dozen of ware fired.



Boilers, too, Need Super Refractories

Shown here is a typical spreader stoker fired boiler with power operated dump grates. CARBOFRAX silicon carbide brick are used in front, side and bridge walls. Above the CARBOFRAX brick in the side walls, MULLFRAX electric furnace mullite brick are used. The unique properties of these two super refractories effectively minimize maintenance costs, eliminate frequent boiler shut downs, increase steam production and improve combustion conditions.

In the fuel bed zone CARBOFRAX brick help maintain full grate area, by offering little or no footing for clinker accumulations. Whatever clinker build up there is can be easily removed with a slice bar without impairing the face of these hard dense brick. They also resist cut-backs due to their high resistance to flame erosion and mechanical abrasion.

CARBOFRAX piers and arches in the front wall combat the very high temperatures developed here. They withstand erosive action of coal being kicked into the furnace, resist slag penetration, and minimize spalling and cracking to prolong service life.

MULLERAX brick are installed in the upper walls because of their unique resistance to fluid ash. Their chemical inertness effectively retards erosion. They remain hard at high temperatures, thereby resisting clinker formations and mechanical wear.

This combination of CARBOFRAX and MULLFRAX brick is being used successfully in many types of stoker-fired boiler furnaces. To obtain facts and figures on installations in specific fields morely select from this list of bulletins. Copies will be sent you at once. No obligation, of course.

Super Refractories by CARBORUNDUM (general catalog) Super Refractories for the

Ceramic Industry Super Refractories for the

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Super Refractories for

Heat Treatment Furnaces
Super Refractories for Gas Generators.
The Frax Line of Coments

CARBOFRAX Refractory Skid Rails Paraus Media for Filtration & Diffusion

Dept. No. H-90

THE CARBORUNDUM COMPANY

Refractories Division

PERTH AMBOY, NEW JERSEY



SAFETY-CIRCLE

* All-Around Protection * Low Maintenance

* Dependable Performance

T HE SAFETY-CIRCLE MOTOR is pro-tected all around against those four great motor killers - corrosion . . . distortion . . . friction . . . foreign matter. The frame is of cast iron, the most corrosion-resistant material for this purpose.

The strength and stiffness of the cast iron is supplemented by ribbing and bracing to maintain alignment and prevent distortion, Ball bearings are lubricated and sealed at the factory. They require no attention for years. End brackets are dripproof at no premium.

SAFETY-CIRCLE motors are fully pro-

tected inside, too. Multiple-dipped and multiple-baked stator plus extra inter-phase insulation provide extra protection against electrical breakdown,

With SAFETY-CIRCLE protection outside and protected working parts inside, you can count on years of trouble-free, low cost power.

For complete details on SAFETY-CIRCLE advantages, see your A-C Authorized Dealer or Sales Office or write for Bulletin 51B6210B. Stocked in sizes 1 to 20 hp. SAFETY-CIRCLE, Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS, 1147A SO. 70 ST.

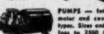
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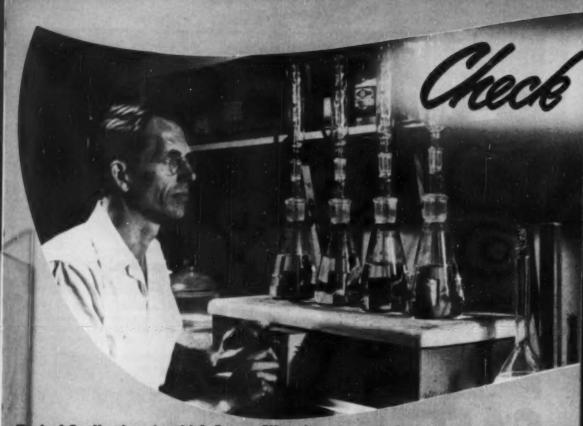
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CONTROL - Meavel,







Typical Applications in which Ampeo Alloys have been used with Cost-Saving Success!

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Pittings — forged, cost Forgings Freelimening onlamna Hangers Heater coils Injectors coils Injectors cases and elements Kettles Line hardware Missus Pana, evaporator Perforated plants
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Vats
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Chemical Agents and the Applicability of AMPCO Alloys

Acetate Solvents (Pure) Crude Acetic Add	EG
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Aluminum Mydronide Ammonia Gas	E
Wet Ammenium Chloride	MR
Ammonium Hydroxido Ammonium Hitrate Ammonium Phosphate Ammonium Suliste	F
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Barlum Chlorido Boor Beet Sugar Liquoro	GE
Bonzone or Bonzol Borax	E
Brins Buians, Bulylons	E
Butadiene Butyric Acid	HH
Calcium Hydroxide Calcium Hypochlorita	MING BUNNAMM MANAGO - MAN
Cane Sugar Liquers Carbolic Acid	E

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Dry
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Garbom Dismillide
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Carbon Carbon
Citicia Acid
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Copper Sulfate
Copper Sulfate
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Toluone or Toluol
Tri Chlorethylone
Tri Sodium Fhosphate
Tri Spodium Fresh
Those rating Game
Those rating may usually
the Interpreted as follows:
E — Excellent
TPY Fenetration
<0.006**
Good
TPY Fenetration
<0.016**
F — Fair
IFY Fenetration
<0.030**
NR — Not Recommended
TPY Panetration
Over 0.050**
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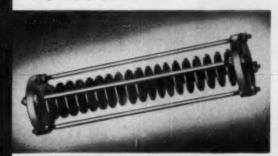
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Your Corrosion Phoblems ... use Ampco Alloys

... these unique properties have proved to be the best answer to many process equipment problems



Ampoe Centrifugal Pumps — Here — for the first time in pump manufacturing history — is a "production-built" and "production-priced" pump to handle actds, alkalies, and other cereative agents hitherto requiring specially built pumps. The Ampce single-stage, single-succion centrifugal pump offers long life, high efficiency and low maintenance costs through the combination of correct design and properly selected meterials.



CORROSION TESTING—Types of Test Specimens — A complete stock of test specimens of a wide variety of materials is kept ready for mounting on racks. Several forms of racks are available for tests in atmospheric locations, pipe lines, tanks or other pressure vessels. When requesting test specimens please outline conditions under which test is to be conducted so that we may supply the most suitable form.

ree

- L High resistance to corrosion
- 2. High tensile strength
- 3. High physicals at extreme temperatures
- 4. High strength to weight ratio
- 5. High impact and fatigue values
- High wear-resistance to erosion corrosion — cavitation, etc.
- 7. High compressive strength
- 8. High modulus of elasticity

Designers and plant engineers in the process industries are turning to Ampco Alloys more and more frequently — because of the outstanding savings offered by their long-lasting qualities.

 Costs are reduced in three ways: 1. Minimum down time, 2. Minimum product loss from parts failure, and 3. Minimum maintenance and replacement expense.

Study the list of time-proven applications and the Ampco applicability chart and apply this data to your own needs. Plan your own economies now by specifying Ampco Bronze Alloys for corrosive and erosive media handling. Write today for recommendations and complete information.





Ampco Metal, Inc.

Milwaukee 46, Wisconsin

West Coast Plant Burbank, California

Ampco Metal, Inc., Dept. CE-9, Milwaukee 46, Wis.

Send me your free bulletin, giving full information on the application of Ampoo Alloys in the Process Industries.

Rame Title

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Sweet's File

9

process industries

processing equipment 1
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electrical equipment 3
materials 4
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plant utilities 6
service equipment, 7

1950

looking



for processing equipment?

All these catalogs of processing equipment manufacturers are instantly available in Section No. 1 of your Sweet's File for the Process Industries.

The other sections of this Sweet's File contain additional scores of catalogs covering a wide range of materials and equipment—useful and up-to-date information on product forms, characteristics, performance and use.

This grouping of manufacturers' catalogs, in

sections according to products or use of products, is made for your convenience, so that you can more readily compare one product with another. Indexes of manufacturers, products and trade names lead you quickly and easily to the catalogs you are looking for.

Sweet's is working constantly to get more manufacturers to send you their catalogs in this easy-to-use form. If you fail to find what you want, please tell us.

Sweet's catalog service

DIVISION OF F. W. DODGE CORPORATION . 119 WEST 40TH STREET . NEW YORK 18, N. Y.



The exteriors may look alike but what a difference inside

Inside one home, life goes on smoothly and harmoniously. But in the house next door there's constant friction and nerve-wearing turmoil.

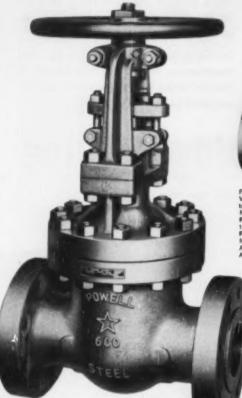


Fig. 6003 -- Class 600-pound Cast Steel Gate Valve with flanged ends, exteids screw rising stom, belted flanged yoke and tapered solid wedge.



Flanged End O. S. & Y. Globe Valve. 190 pounds W. P. Face-to-face dimension conforms to to-face dim

MSS SP-42. Fig. 2475 — Available in 18-85, 18-85 Mo, Durimot "20." Fig. 2477 — Available in Nickel, Monel Metal, Everdur, Ampeo Alfoys, Hastelloy Alloys A-B-C-D. Also made with Screwed Ends.



Flanged End O. S. & Y. Gate Valve. 150 pounds W. P. Face-to-face dimensions performs in MSS SPR2. Figs. 2671 (Solid Wedge) and 3666 (Double Wedge) available in 15-85, Mp. Durtinot "20. Figs. 2472 (Solid Wedge) and 2489 (Double Wedge) available in Nickel, Mendi Metal, Ampos Alloys, Everdur, Hateldioy Alloys A-B-C-D. Also made with Screwed Ends.

Fig. 2006—Bronze Globe Throttling Valve. Full flow through the seat when wide open. Has special bronze stem and stainless steel dies and seat hardened to approx. 900 Brinell.

Compare the outside appearance of any standard Powell valve with that of any other valve of the same type and size. You will probably notice very little difference. But inside—that's another story.

There design, materials and manufacturing skills make the difference between a Powell Valve—built to operate smoothly and efficiently over a long period of time and a valve that will have only a short life before it requires maintenance or even replacement.

Powell also makes many exclusive patterns to meet the requirements of special services. In these, too, long, trouble-free performance is a primary consideration.



Fig. 889 — 135-pound Iron Body Bronze Mounted Swing Check Valve with flanged onds, botted flanged cap and reprindable, renewable brenze sest and \$580.



The Complete Powell Line Includes Globe, Angle, "Y", Gate, Check, Non-return, Relief, and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosien-resistant metals and alloys.

Ask your nearest Distributor-or write direct

The WM. POWELL Co., 2525 Spring Grove Ave.

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VALVES

Es Laboratory







MASS SPECTROMETER

Preferred by users because:

- · Automatically records mass concentrations
- Wide mass range of 1 to 300
- · High resolution and sensitivity
- Convenience of operation
- · Special servicing features cut down-time

Uses include analysis of:

- Hydrocarbon streams
- Deuterated compounds
- Isotopes
- Petroleum chemicals

Check coupon for bulletin GEC-587

controls moisture content of gases accurately



DEWPOINT RECORDER

- · Gives you continuous record
- Wide range . . . to −90° F
- Automatic 24 hour operation
- Stable operation
- For use in-
- Controlling mechanical or chemical air dryers
- Monitoring moisture content of gases in manufacturing or production processes
- Protecting furnaces from moisture content above specification
- Controlling conditions in testing and research laboratories

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FOR HELP ON your measuring and testing problems...
call the nearest G-E sales office.

TO CONTROLL FOR FOR CHEMICAL PROCESSES



speed up research and production



- Increases production by furnishing a means of controlling color processes
- Provides a practical, scientific means of setting up color standards and color tolerances
- Furnishes a means of rapid colorimetric analysis
- Automatically produces a linear curve of reflectance

For analyzing • Chemicals • Dyes • Paints • Inks

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find leaks quickly



LEAK DETECTOR (TYPE H)

Gives You-

- High sensitivity—will detect very small leaks
- Saves time, money; versatile
- Compact and portable.
 Weighs less than 18 lbs.

For use in plants where-

- Halogen compounds are piped
- Pressure testing of valves, pipes, and joints is made
- Large tanks and equipment must be checked

Check for Bulletin GEC-233B



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Section CAST-47

Apparatus Department,

General Flactric Company, Schanoclady, N. Y.

Please have a sales engineer call to discuss

Please send me the publications checked below:

- For information only
- Planning an immediate project

GEA-4613, Dewpoint Recorder GEC-233B, Type H Leak Detector

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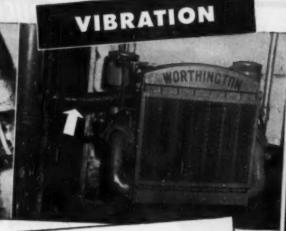
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GENERAL (%) ELECTRIC

Here's how CMH FLEXIBLE

solves the basic motion

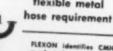
MISALIGNMENT



● For the dewaxing filter connections illustrated, CMH corrugated flexible metal hose solves the misalignment problem and compensates for expansion and contraction as well. The use of CMH Flexible Metal Hose for making connections between misaligned sections of piping frequently saves time and money ... it eliminates the need for complicated piping and an excessive number of fittings ... it also simplifies and speeds up assembly and disassembly of the piping.

Nibration in the air compressor shown above was isolated by means of inserting short lengths of CMH flexible metal hose into the connecting lines. In all installations which incorporate vibrating components such as compressors, turbines, engines, etc., CMH flexible metal hose used as the connecting link to fixed piping effectively isolates the damaging effects of vibration and minimizes objectionable noise.

CMH ONE DEPENDABLE SOURCE for every flexible metal



PLEXON identifies CMN products that have served industry for over 48 years.



Metal Canduits in a variety of types and materials.



Expension Joints for all pressures—copper, steinless steel and other alleys.



Convoluted Motal Hose in a variety of types—steel bronze and allays.



Bellows for all requirements brass, stainless steel and other allays.



Corrugated Metal Hose in steel, branze stainless steel and other alleys.



Standard Assamblies of metal hose components for specialized applications.

Leaders in me Science of Flexonics

METAL HOSE

problems of conducting liquids, gases and solids

EXPANSION

FLEXATION

■ The gas connections in this boiler are subjected to expansion and contraction as the unit is brought up to operating temperature. Short lengths of CMH flexible metal hose solve this problem and eliminate the misalignment problem, too.

Use CMH flexible metal hose or expansion joints in all services that include piping which is subject to expansion and contraction.

The steam connections for this rubber molding platen press are typical of how CMH flexible metal hose is used for moving connections on everything from rugged tire vulcanizers to delicate weigh tanks. When connections between moving sections are made with CMH flexible metal hose, the lines are able to offer metal hose, the lines are able to offer and at the same time withstand high and at the same time withstand high temperatures, high pressures and frequent, repeated motion for long periods.

IN CMH's complete line of flexible metal hose products there is the exact type to meet your needs. Pressures from vacuum to 12,000 psi (burst) and temperatures from far below 0° to 1600° F. can be accommodated by the various types. CMH flexible metal hose is manufactured in a wide variety of metals including types which are corrosion resistant, fire resistant and able to

hold extremely searching liquids and gases.

Whatever your connection problem, if there is misalignment, vibration, expansion or flexation, CMH offers the economical, dependable, safe solution. If you do not already have literature describing the CMH line of flexible metal hose products, write for it today mentioning the types of connection problems you have.

CHICAGO METAL HOSE CORPORATION

1317 S. Third Avenue

Maywood, Illinois

In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ontario



When Your Intermediate Needs Are Immediate, Call Monsanto

Strategically located district sales offices, warehouses and chemical plants are the facilities which Monanto has to serve industry with more than two-score intermediates. In addition to its extensive line of intermediates, Monanto is able to produce special chemicals for industries with special needs.

Monsanto's physical facilities offer you prompt service at favorable prices and low transportation costs. More important to you is traditional Monsanto quality, characteristic of all Monsanto intermediates. This quality is your assurance of uniform intermediates that can be counted upon to deliver excellent results in your plant.

Next time you have immediate need for intermediates, get in touch with the nearest Monsanto Sales Office, or write to Monsanto headquarters in St. Louis. Seven Monsanto Intermediates are described on these pages.

A Few of Many Monsanto Intermediates

CYCLOHEXYLAMINE

Molecular Weight: 99.17

Fermulas

NH2

Properties: Clear, proctically colories liquid. Specific Gravity—0.870-0.874 at 15.5°/15.5° C. Distillation Range—First drop 132.0° C. min., 95% (1-96 ml) 4.0° C. max., dry point 137.5° C. max.

Reactions: A strong base whick forms solts with all acids including CO₂ from the air. Farms scape with long chain fathy acids. One or both hydrogens attached to the nitrogen may be replaced by allyri, orality, any lor allyriol groups. Reacts with CS₂ to form a difflictant/barmets and condenses with aldehydes. Reacts with 2,2'-dichloroethyl ether to form M-cyclohexylmorphaline.

Uses: Dysstuff intermediate, petroleum additive, component in bailer water treatment, corcosion inhibitars, organic synthesis.

DICYCLOHEXYLAMINE

Malecular Weight: 181.31

Farmula

H₄ H—H

Preparties: Clear, practically catarioss liquid. Specific Gravity — 0.913-0.919 at 15.3°/15.5° C. Distillation Range — First drop 352.0° C. min.; 95% (1-96 ml) 4.0° C. max.; dry point 258° C. max.

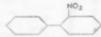
Reactions: A strong base which forms salts with all acids. Furms soaps with long chain faity acids. The hydrogen attached to the nitrogen may be replaced by an alkyl, aralkyl, aryl or alkylel group. Farms crystalline hydroles and alcoholoises at low temperatures.

Uses: An intermediate in the manufacture of all additives and insecticides.

ortho-NITROBIPHENYL (ortho-Nitrodiphenyl)

Formula

Mol. Wt.s 199.20



Properties: Yellow-to-reddish crystalline selfd or oily liquid. Crystallizing Point—34.5° C. Belling Point—About 325° C. Flash Point—290° F. Specific Gravity at 25°/25° C.—1.20.

Reactions: Can be reduced to artho-aminobiphenyl or intermediate reduction products. Can be further intrated or halogenated with the entering group going predominantly into the unsubstituted ring.

Suggested Uses: As a plasticizer for a variety of rains and plastics. It is compatible with the cellulose states and ethers, polyvinyl chairde, polyvinyl chloride copolymers, polyvinyl formal and butyrol, polyvinyl acetate, polystyrene, roain, roain seters, modified phenolic resins, all soluble phenolic resins, all tyd resins and vegetable oils.

As an intermediate in the manufacture of dyestuffs and other products.

ortho-ETHYLANILINE (ortho-Aminoethylbenzene)

Formulas

Mel. Wt.: 121.18



Propertiess Coloriess liquid, durkens on standing. Balling Point—about 215° C. Specific Grav-

ity at 25°/25° C.—0.98. Miscible with alcohol and benzene, slightly miscible with water.

Reactions: Undergoes typical reactions of oromatic amines such as acytation, alkylation and diazotization. Condenses with addehydes and reacts with CS₂ to give substituted thisarreus.

Supposted Uses: As an intermediate in the manufacture of aza dyes, pharmaceuticuls, rubber chemicals and other products.

ortho-ETHYLNITROBENZENE

Formula

Mel. Wt.: 151.16

Properties: Clear, yellow-to-green liquid. Bailing Point about 228° C. Specific Gravity at 25°/25° C.—1.1. Crystallizing point about minus 13° C.

Reactions: Can be reduced to artho-ethyloniline and other intermediate products. The side chain can be oxidized to give arthontirobentatic oxid.

Suggested Usess As an intermediate in the preparation of dyestuffs, pharmaceuticals and other products.

meta-CHLOROANILINE

Formula

Mal. Wt.: 127.57



Properties: Clear light-yellow liquid. Assay —99% min. Crystollizing Point—mines 10.6° C. min. Distillation Range—228° C. start, 231° C. dry point, 93% within 1.0° C.

Reactions: Undergoes typical reactions of aromatic emines such as dispatization, acylotion and alkylotion. Reacts with CS₂ to give substituted thioareas and condenses with oldehydes.

Suggested Uses: As an intermediate in the manufacture of ase dies and pharmaceuticals.

meta-CHLORONITROBENZENE (meta-Nitrochlorobenzene)

Formula

Mai. Wt.: 157.56



Proportios: Greenish-yellow crystolline mass. Crystallizing Point—43.9° C. min.

Reactions: Can be reduced to meta-chloroonline and other intermediate products.

Can be further chlorinated, nitrated or sulfanated.

Suggested Uses: As an intermediate in the preparation of dyestuffs and pharmaceuticals.

PLASTICS COSTS CUT BY USE OF LOW-PRICED HB-40

Monsanto's improved HB-40 (partially hydrogenated terphenyl) is an avenue for reducing costs while maintaining quality in vinyls, polystyrene dispersions and casting resins. HB-40 is unusually low in price.

Improved HB-40 is practically waterwhite, making its use possible in plastics that are brightly colored or clear. Properly stabilized clear and tinted vinyls, in which HB-40 serves as an extender plasticizer, have good light and heat stability.

HB-40 is economical in two ways. First, it is attractively low in price on a pound basis. Second, it is low in price on a pound volume basis since its specific gravity is 1.004.

HB-40 is relatively nonmigratory and is regarded very low in toxicity. In many vinyl formulations it can be used as an extender for higher-priced primary plasticizers to the amount of 25 per cent of the total weight of plasticizers. In many polystyrene dispersions it is the only plasticizer required.

For further information on Monsanto's HB-40, mail the coupon.

SANTOMERSE No. 1 SOLVES MANY TOUGH DETERGENCY PROBLEMS



SANTOMERSE No. I is a rapid watter. The photo above shows wooken yarn floating on water. Within seconds after a small amount of Sontomerse No. I was added, the yorn was just through and through and sank.

If you have a tough problem of detergency, emulsifying or wetting out, investigate the possibilities of Monsanto's Santomerse 8 No. 1.

Santomerse No. 1 is the all-purpose detergent and wetting agent. It is effective in acid, neutral and alkaline solutions ... in hard or soft water. Santomerse No. 1 does a thorough job in hot or cold solutions. Because of its efficiency in hard water, Santomerse No. 1 prevents the formation of insoluble curds which are detrimental in some industries.

Santomerse No. 1 is an alkyl aryl sulfonate compound having a minimum of 40% active ingredient. It is unexcelled by any similar detergent-wetting agent.

For further information on Santomerse No. 1, contact the nearest Monsanto Sales Office or mail the coupon.

LOWER PRICES ON STEROX SE, SK, 5 and 6 SURFACE ACTIVE AGENTS

Prices on four of Monsanto's non-ionic surface active agents have been reduced from 3 to 5 cents a pound. These products, Sterox* SE, SK, 5 and 6, also are good emulsifiers and detergents. Mail the coupon for details.

MONSANTO CHEMICAL COMPANY

PAINTS ARE IMPROVED BY USE OF MONSANTO'S FAMILY OF AROCLORS

Whether you are a user or a manufacturer of maintenance paints, the Monsanto AROCLOR * family is important to you. It is important because of the extra qualities it puts into paints.

The qualities that the AROCLORS (chlorinated biphenyl and chlorinated polyphenyl) put into protective coatings mean protection. They give paints greater toughness and adhesion . . stronger resistance to corrosion, flame, water and weather . . . greater resistance to acids and alkalies. The AROCLORS have good electrical properties.

If you are a user of maintenance paints, you will like the long-lasting qualities of coatings containing AROCLORS. It is possible that such paints will reduce your maintenance costs.

If you manufacture paints, it will be worth your while to look into what the ARO-CLORS have to offer. There's a series of AROCLORS, both liquids and resins, having a great variety of properties. For data on AROCLORS, mail the coupon.



FREE!

If you use phosphoric acid, mail the coupon for your five copy of "The handling of 75% phosphoric acid in tank car quantities."

MONBANTO CHEMICAL COMPANY, 1702-] South Second Street, St. Louis 4, Missouri. District Sales Officer: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

*Boy. U. S. Post. Of.



SERVING INDUSTRY ... WHICH SERVES MANKIND

Dicyclohexyl			
AROCLORS.			
Santomerse	No.	1.	

LITERATURE: | Phospheric Acid.

SAMPLES: | ortho-Ethylaniline. | ortho-Ethylnitrobenzone. | meta-Chloroanilins. | | meta-Chloronitrobenzone.

1702-J South Second Street St. Louis 4, Missouri	
Please send information indicated at the left.	
Nume	Me
Company	
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Taylor's New Midget gives continuous 30-day chart

MOVING THIS LEVER FROM NORMAL "SET" POSITION TO

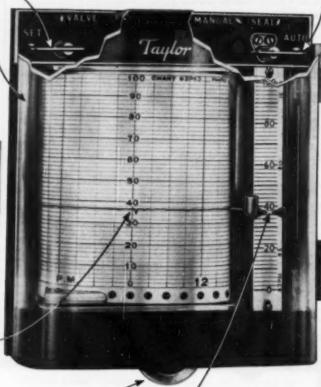
"VALVE" CAUSES SET-POINTER (extreme right center)
TO INDICATE CONTROL VALVE OPENING.

AUTOMATIC-TO-MANUAL UNIT

STREAMLINED CLEAR PLASTIC DOOR ENCLOSES ALL ADJUSTMENTS, YET GIVES FULL VISIBILITY OF CHART, SET-POINTER, AND WHETHER ON AUTOMATIC OR MANUAL CONTROL.



THREE HOURS OF CONTINUOUS RECORD, FULLY VISIBLE ON RECTILINEAR CHART



SET-POINT ADJUSTMENT PROCESS CONTROL POINTER (16A)
DIRECTLY CONNECTED TO PEN,
GIVES INSTANT COMPARISON
WITH SET-POINTER (right).

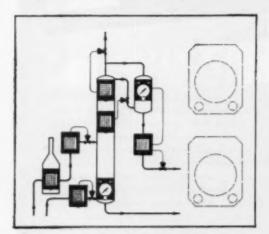
HOLD IT RIGHT UP TO YOUR OWN PANEL BOARD

TRANSET* RECORDER record on 4% x 5 panel space

THIS tiny (4%x5") pneumatic TRANSET RECORDER for flow, liquid level, pressure and temperature, greatly simplifies the most complicated central control problems. It indicates and records in the same space required by a conventional-sized indicator alone. And it eliminates receiver wings on even the most up-to-date central control panels (particularly graphic panels).

The TRANSET RECORDER gives a continuous 30-day process record with three hours visible—remote setting of control point—automatic-to-manual unit—instant check on controller performance—and control valve position—all these—right where you want them!

- 1. Automatic-manual unit
- 2. Remote set-point adjustment
- 3. Valve position indication



Graphic Panels realistically relate instrumentation to the process. This scale drawing shows how Transet Recorders and Indicators remotely show all the essential process data and take no more space than indicating receivers alone—eliminuting the need for space-realing wings.

HERE ARE A FEW UNIQUE ADVANTAGES:

- Easily removable chart-drive mechanism for reloading. Automatic current cut-off (optional).
- 2. Chart rewind (optional).
- Scale shows actual transmitter process range
 —is graduated 3-15 psi, for checking calibration and valve position.
- 4. Automatic-to-manual feature gives easy start-up-makes it easy to service controllers.

You Can Get These 4 Models: (1) One process record, set-point indication, set-point adjustment, valve position indication, and automatic-to-manual unit. (2) One process record, valve position indication, and remote manual valve loading. (3) One process record only. (4) TRANSET Indicator—operation same as Recorder only with indication instead of 30-day chart record.

Yes, Taylor has a TRANSET INDICATOR tool

Fits into the same panel cutout as TRANSET RECORDER. Many parts interchangeable with TRANSET RECORDER. Available with or without Automatic Manual and remote control point setting.



For Complete Details, Send for Bulletin 98079. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

* Registered Trade-Mark

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

Memo to: PRODUCTION MANAGERS PLANT SUPERVISORS PACKAGING ENGINEERS PURCHASING AGENTS

youll be glad for a long time to for a long time to come when you choose your next bag closing machine from the Bagpak line!

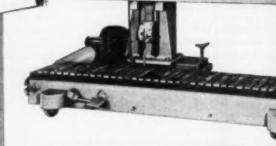
especially the same on the ET except that it applies the femous "Cookien Stirch" soly. For use where tupe is

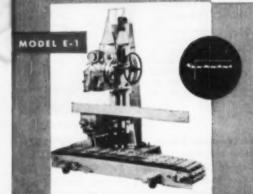






MODEL ET



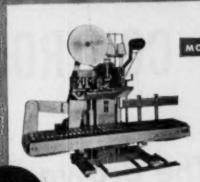


Applies a sawe-thru "Dry Tope" for better protection at lower cast. Tape overs the long and — femous "Coshion Stick" goes thru both tape and bag for errorger, tighter, yet any-to-open abovess. Choos textile longs as well as multiwalls. Sami-outcombir, self-centained, easy to operate, FAST (up to 15 per minute), pertable, welded steel accorrotten and clean-out design for trackle-free operation. Dimensional drawings and detail information available in Sacklet ET. Write for your copy today.

Bag Closing Efficiency

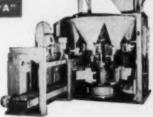
The BAGPAKER

A big mechine for a big job, fine head "A" handles 25 to 45 tens per head "A" handles 25 to 45 tens per head "A" handles 25 to 45 tens per head "A" handles 20 tens per minute, and pays for itself in 1 to 3 years—just out of labor and metoried savings! Takes free—or semi-tree-flowing materiels and does a fully sutemetic job of weighing, filling, settling, sewing and seeling. Accorate weights, filling procedure reduces heag costs. Sturdy construction inseres form, trouble-free life. A letter free year brings full details.



MODEL DA

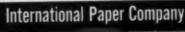
MODEL "A"



Do you perform a large press. The same print?—or one that result for head print? The Suppose DA Marchine applies a sealing large arror for he has been town. The large arror in francous "Cushina Birch" to their and the applies being my period light floor sifting, reside resources.

The sewing based and lags according to the control of the control

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SUPER-SENSITIVE CONTROL WITH...

The Brown Remote Indexet

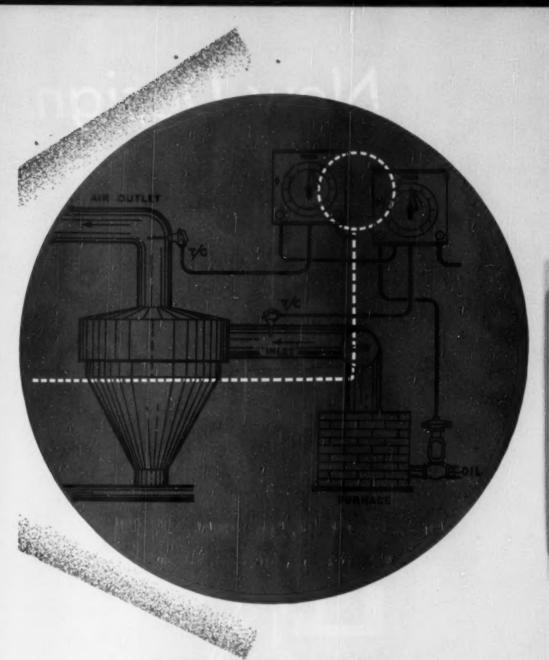
THE Brown Remote Indexet affords a positive way to a new man possensitivity and accuracy of control action . . . meeting the unusual demands of many types of advanced process equipment.

Typical is its application to the control of the drying chamber in a spray drying unit for distillers solubles. Here, the outlet temperature controller sets the index of the secondary instrument, whose thermocouple is inserted in the inlet air duct. The secondary instrument actuates a control valve on the oil flow to the furnace.

With the use of these controllers interconnected by means of the Remote Indexet, the inlet temperature controller compensates for the undesirable process characteristics of heat transfer in the furnace while the outlet temperature controller compensates for the process characteristics of the drying chamber.

The result is super-sensitive cascade control, with rapid response to variations in operating conditions.

For full particulars on the use of the Remote Indexet for your particular process, call in your local Honeywell engineer... he is as near as your phone. MINNEAPOLIS-HONEYWELL REGULATOR Co., Industrial Division, 4478 Wayne Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.



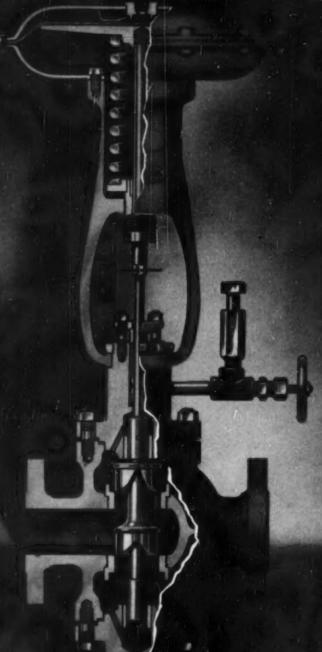
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FOR THE CHEMICAL INDUSTRY

Honeywell

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- Design insures minimum of hysteresis.
- Large effective area, moulded diaphragms provide positive response.

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- · Facilitates installation.
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 Modern machinery, tools and fixtures; precision manufacturing methods; rigid inspection during processing and assembly all insure exact reproducibility of parts uniform performance.

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- Comparable parts interchangeable between all Percentage Parabolic and Percentage V-Port Valves.
- Trim sizes interchangeable among Percentage Piston Valves.
- Springs for 6-30 psi range may be substituted for 3-15 psi range.

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For design details and specifications write for bulletin



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Your maintenance system, for example!

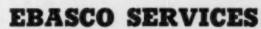
Unless your maintenance program works on a continuous, preventive basis, you are exposing your business to a major breakdown of equipment! Think what it would cost in lost production . . . lost sales . . . keeping idle workers on your payroll! A preventive maintenance program—developed and installed by Ebasco—prevents shutdown of industrial equipment through a regular inspection schedule adapted to individual plant needs. It regulates the frequency and nature of maintenance work—strikes a balance between too many and too few inspections. It provides for safe equipment and adequate spare equipment. It sees that your records of maintenance are well-correlated and used, instead of being merely filed.

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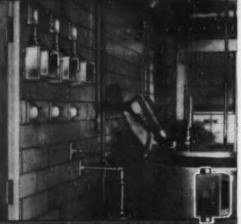
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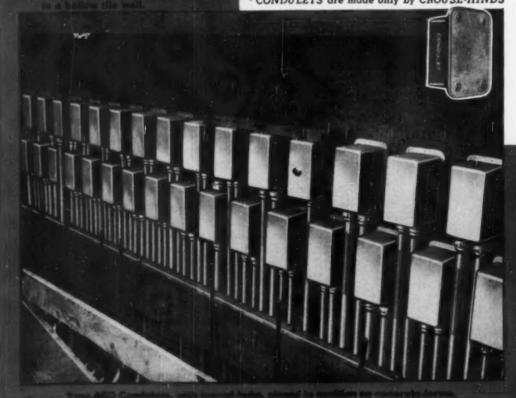
the CONDULET" and rigid conduit method gives you maximum



PROTECTION and SAFETY in concealed work

When you plan a job of concealed electrical wiring, every factor that has a bearing on the kind of service it will give throughout the life of the installation should be carefully considered.

*CONDULETS are made only by CROUSE-HINDS



- ECONOMY ... Add up the material and the installation costs and you will find that Condulets and rigid conduit compare favorably with other wiring methods. Then consider the other advantages and you will find that Condulet and rigid conduit is the really economical method that pays extra dividends over the years.
- GROUND CONTINUITY is of vital importance in concealed work because any joint that isn't tight in the beginning makes a high resistance point and after the concrete has been poured there is never any way to locate and correct the faulty condition. CONDULETS, with their taper threaded hubs, and tigid conduit with its tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This SAFETY feature affords maximum PROTECTION against personal injury and fire.
- CORROSION RESISTING . . . Cast Feraloy Condulets offer the best PROTECTION wherever moisture, dust, or corrosive atmospheres are present. This quality is very important in concealed work because corrosive tendencies are greatest where there is a change of medium, as at the point between the floor or wall and the air.
- FLEXIBILITY . . . In concealed work Condulets with blank covers can be placed at strategic locations to provide future outlets to meet changing conditions.
- SECURE ATTACHMENT OF DEVICES ...
 The mounting holes in CONDULETS are drilled and tapped in the cast metal body no weak mounting ears to twist off.
 All devices are FIRMLY attached.
- GUALITY ... For more than forty-five years CONDULETS, made only by CROUSE-HINDS, have been the standard of quality, built from the finest materials, with painstaking care, by skilled cattennen.
- VARIETY ... There are thousands of types and sizes of CONDULETS, plugs and receptacles, and lighting fixtures including a complete explosion-proof and dust-tight line for use in hazardous locations.

On your next job of concealed work, plan to get all of the benefits of sturdy Cast Feraloy CONDULETS and rigid conduit, Send for additional information on modern CONDULET installation.

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GUA Series Explosion-Proof Condulets with lugs for nailing to concrete forms.

Type EHS
Explosion-Proof
Switch Condulet
in a hollow tile wall



Type AD Watertight Condulets for flush mounting in floors or walls.

RF Series

GRF Series drilled and tapped
Condulets with
slotted nailing

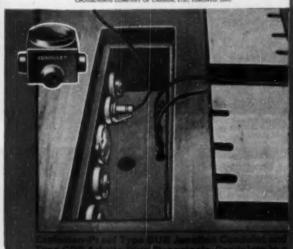
Type FJC Condulets for floor outlets.



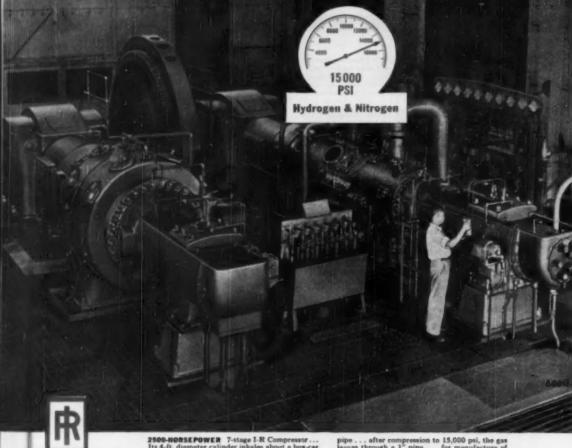
SK Series Condulets with nailing lugs. For walls, floors or sidewalks. Have flush cover screws,



Type SKC Condulet and Type EY Large Radius "Y installed in concrete.







2500-HORSEPOWER 7-stage I-R Compressor... Its 4-ft. diameter cylinder inhales about a bon-car full of gas every minute through a 20" intake

pipe . . . after compression to 15,000 psi, the gas leaves through a 1" pipe . . . for manufacture of explosives and fertilizers.



SUTYL-RUBBER unit uses these I-R gas-en-gine-driven Compressors , , seven being 300-hp ammonia and five 300-hp othylene



MAXIMUM PLANT ECONOMY and RELIABILITY and high degree of interchangeability, are attained even though each of these six I-R compressors handles a different gas and pressure condition in a chemical plant.



RECYCLING GAS . . . 4800 hp of I-R 4-cycle V-angle compressors . . . 1500 pei intake, 4100 pei discharge.



HYDROGEN compressors, 2500 psi, 4-stage ... two 150-hp I-R units ... non-lubricated pistons with graphitic-carbon wearing and pressure rings.



2000-TON Electric-driven heavy-duty ammonia compressor in brewery service . . . (I-R also builds Steam-Jet Water-Vepor Refrigeration units).



ELECTRIC-DRIVEN 200-hp heavy-duty vacuum pumps in glass-manufacturing plant . . . (I-R also has complete line of steam-jet ejectors and complement.)



5000-hp TURBO-BLOWER . . . turbine-driven I-R multi-stage unit compressing 57,600 cfm to 20 psi.



HYDROFORMING plant uses this I-R 1200hp single-stage blower . . . up to 300 psi pressure . . . up to 800° F, inlet temperatures.



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12,500 HORSEPOWER TOTAL . . . five I-R 6-stage synchronous-motor-driven compressors handling nitrogen and hydrogen at 4500 psl.

Name your Gas, Name your Pressure, and your Service Conditions

Whatever the problem, you can depend
on Ingersoll-Rand's 70 years of experience
to meet your process compressor requirements.

more efficiently more dependably more economically

Pictured here are just a few of the thousands of Ingersoll-Rand process compressors and blowers that are on the job in practically every branch of the chemical, petroleum, and process industries. Every one of them is precision-built to the highest standards to do the particular job for which it was sold. This compressor experience means:

- No compressor problem is completely new to Ingersoll-Rand. Details may differ, of course, but whatever your specific requirements, chances are Ingersoll-Rand has already built a process compressor, reciprocating or centrifugal, for a similar purpose.
- Dollar savings to you in terms of sustained production, safety in operation, and low maintenance costs result from the years of design and manufacturing experience behind I-R compressors.

Our design and application engineers will be glad to help solve your compressor problems at any time. Simply get in touch with your nearest I-R representative.

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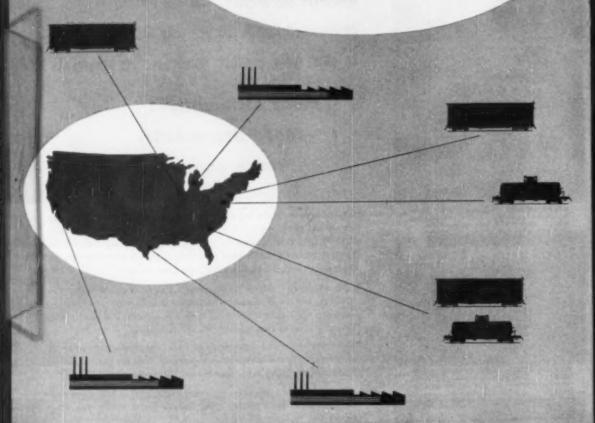
Builder of Reciprocating and Centrifugal Compressors

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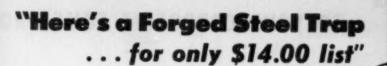
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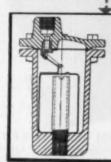
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For higher pressures and larger capacities Armstrong builds a complete line of heavy duty forged steel traps. Ask your nearby Armstrong representative to quote on the traps you need now.

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CHEMICAL ENGINEERING—September 1950

The Money-Saving Answer to your corrosive fume problem



If you have corrosive fumes to remove, "Buffalo" Rubber-Lined Exhausters will give you 3 to 12 times longer service than metal fans. This "Buffalo" idea is not new—it has been saving the chemical industries money for many years. Rubber lining on all fan parts exposed to fumes protects the fan, where ordinary metal would be quickly destroyed. And high efficiencies in these "Buffalo" Fans add power savings to your maintenance savings. Put "Buffalo" Rubber-Lined Fans on your fume removal job, and you'll have the cheapest answer to this problem. WRITE FOR YOUR COPY of Bulletin 2424-E which gives all engineering data.

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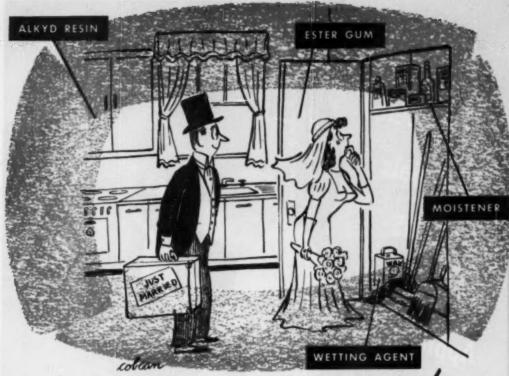
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For a brighter future... Glycerine!

TODAY'S housewife depends on Glycerine to an extraordinary degree! In glass cleaners—silver, furniture, and as a matter of fact all kinds of polishes, Glycerine performs a variety of functions. But more important, it has contributed to the tough, durable white or colored decorative finishes she considers so necessary in her shining kitchen! Glycerine-derived alkyd resins with their short time baking cycles at low temperature, have made possible these flexible, mar-resistant coatings that protect and beautify a number of familiar bousehold appliances and equipment. How Glycerine came of age in the synthetic resin field ... and the part it plays today, is clearly outlined in an easy-to-read booklet "Why Glycerine for Alkyd Resins and Ester Gums?" Write for your copy!

TOMORROW, Glycerine will find its way into the reaction vessels of industry in larger and larger quantities. Even now, the manufacture of synthetic resins and ester gums claims more Glycerine than does any other field of production! And every indication points to wider application for the alkyd resins—long recognized as one of the most important synthetic products used in protective coatings. Take the field of molded plastics, for instance: a recent patent describes how a Glycerine-derived alkyd resin is used to plasticize melamine and formaldehyde resins, resulting in a thermosetting composition for molding and laminating plastics with improved flexibility and impact strength. Further details will be sent on request. (Please use your company letterhead.) Here's one more reason why—nothing takes the place of Glycerine!

Nothing takes the place of Glycerine



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Properly Engineered **Materials PLUS** Skilled Application
"Know-how" TYGON the chemically inert plastic in a wide range of compounds THAT, in a nutshell, is the reason RESILON why more and more engineers are hydrocarbon resin

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They know that from the wide range of lining materials manufactured by U.S. Stoneware that we can suggest, without prejudice, the lining material best suited for a given job. They know that the skill and knowledge acquired through 80 years of leadership in fabricating corrosionresistant materials and equipment is assurance of an application technique, an engineering "know-how" that means a better tank lining job no matter what material is used.

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COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

New contact acid process

RADICAL CHANCES—Chemical Construction Corp. has come up with a brand new contact process for making sulphuric acid from sulphur. The new process gives consistent conversion efficiencies over 99 percent. A contact plant of this type can deliver sulphuric acid of any strength up to 95 percent. And one of these plants costs considerably less per ton of capacity than a conventional contact plant. Already, one such plant is operating at the Hamilton, Ohio, alum plant of American Cyanamid. Rated at 50 tons per day on a 100 percent H₂SO₄ basis, the unit has easily reached 120 percent of design capacity.

of one of these new Chemico units is the elimination of much equipment found in orthodox contact plants. These six major items of equipment have come out: drying tower, gas filter, heat exchangers, SO₃ cooler, intermediate acid coolers, and diluting equipment.

FEATURES—Chemico's new contact unit is chock-full of novel features. A quench converter eliminates heat exchangers; it assures a higher yield from the raw sulphur; and it brings atmospheric contamination due to unconverted SO₂ close to the vanishing point.

A two-stage absorber, operating by gravity flow, eliminates the need to distribute acid over packed absorbing towers. In the first or high-strength stage the SO₃ gas mixture from the converter bubbles up through the acid from a dip tube; in the second stage it passes through a weak acid spray. In both stages the sensible heat of the gases and the heat of absorption are dissipated by evaporating water from the acid. Thus the absorber doubles as a cooler, making large cooling surfaces and big volumes of cooling water unnecessary. Only enough water is required to cool the product acid, and this water is later used for absorber acid makeup.

A built-in Pease-Anthony venturi scrubber knocks acid mist out of the exit gases before they are vented to the atmosphere (for a story on how one of these contact plants works turn to p. 181).

No chemical empisifiers in bread

BREAD STANDARD—Chemical softeners and emulsifiers for bread are not authorized by the tentative standard issued August 8 by the Federal Security Administrator. This omission could become in effect a prohibition against the use of such chemicals. The bread standard was drawn up by the Food & Drug Administration after nine years of hearings.

PROHIBITED CHEMICALS—According to the FDA, the evidence does not justify a finding that the recognition of the following chemicals as optional ingredients in bread would promote honesty and fair dealing in the interest of the consumer: mono and diglycerides of acetylated tartaric acid; cheese when containing calcium sulphate; ammonium persulphate and potassium persulphate; sorbitan esters of fatty acids, polyoxyethylene sorbitan esters of fatty acids and polyoxyethylene esters of fatty acids.

While FDA did not say when its order would take effect, it did say that interested parties had to file their exceptions within 30 days of August 8.

REACTION—Atlas Powder Co., for one, was quick to react. President Isaac Fogg of Atlas declared, "It is certain that the company will file exceptions to the tentative standard in order to demonstrate that the Atlas emulsifiers should be included in any bread standard finally put into effect.

"One of the advantages imparted by Atlas emulsifiers," Fogg pointed out, "is retention of softness in bread. The tentative standard apparently questions the desirability of this function. This is particularly surprising in view of the fact that other emulsifier compositions sold for similar purposes by large shortening manufacturers are included in the tentative standard.

"Although the findings of fact confirm the lack of evidence that any of these Atlas products are harmful, the administrator seemingly is not satisfied that they have been proved conclusively to be harmless.

"Emulsifiers developed and produced by Atlas over a period of 10 years," Fogg stated, "have been found extremely useful for improving bread and other baked goods. Testimony by representative bakers and cereal chemists during the hearings before the Food & Drug Administration attested to this fact."

HEARINGS—There have been hearings in 1941, 1943, and the last and longest from Nov. 30, 1948, until Aug. 12, 1949. Findings and a proposed standard were issued in 1943, but final standards were not issued after the first two hearings because of war conditions. The last hearing was marked by self-rising (Continued on page 71)

From SHELL CHEMICAL



(CH₃)₃C-O-O-C(CH₃)₃

Stable polymerization catalyst ... at a new lower price

Shell DTBP provides many unique advantages as a catalyst for moderately high-temperature resin polymerization. Now the economy of reduced cost has been added to these qualities:

Stability...DTBP is insensitive to shock...can be stored without composition change or danger of explosion. Its decomposition rate is uniform ...governed entirely by the temperature of operation, independent of kind of monomer, prepolymer, or reaction medium.

Color and Clarity...DTBP leaves no color forming bodies, no acid residue ...helps to produce lighter colored polymers...particularly suitable for styrenated alkyds, polystyrene and styrenated oils.

Ease of Handling . . . no special precautions required . . . non-corrosive and readily soluble, not

PROPERTIES of DTBP

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Bolling Point, "														
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Samples available. Technical literature and a sample of DTBP for your own evaluation will be sent on receipt of your letterhead request.

only in most resin monomers, but also in viscous partial polymers.

High Catalytic Efficiency...a high degree of conversion from monomer to polymer is obtained with DTBP per unit weight of catalyst.

DTBP is available in commercial quantities, and is shipped in 1-gallon, 5-gallon and 15-gallon containers.

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THE CHEMENTATOR, continued

tempers and prolonged by yeasty controversies over whether certain chemicals not in general use before World War II should be added to the permissible bread ingredients listed in the 1943 tentative order.

Air polition control bill in Congress

Although still denying that they favor a federal air pollution control bill, U. S. Public Health Service officials are expected to testify in favor of the Douglas air pollution research bill (H. R. 9379) now in the Committee on Interstate and Foreign Commerce.

The bill, introduced by Administration supporter Helen Gahagan Douglas, a California Democrat, provides for a three-year program of research and investigation. Under the proposed legislation the Bureau of Mines and the U. S. Public Health Service would each get \$500,000 for the first year to carry on this work.

Public Health Service is already doing air pollution research. The Bureau of Mines is not mentioned in the proposed law—although the Secretary of the Interior is—but the bureau would probably carry on this work since it already has an air and stream pollution branch.

The Surgeon General of the Public Health Service would be authorized to conduct a "program of investigation and research into the health hazards of atmospheric pollution designed to determine the long range and chronic, as well as the acute, effects of atmospheric pollution on health."

PHS has been plugging for more laws (not necessarily federal) before meetings of doctors, nurses and other health control personnel. The Douglas bill declares the research proposed is essential, among other things, for the "promotion of the nation's industrial capacity."

Hooker signs five-year pact with workers

A new five-year contract has been signed by Hooker Electrochemical Co. and the Niagara Hooker Employee's Union. It covers workers at the company's Niagara Falls plant. Among the nearly 50 items negotiated: a general pay increase of 6 c. an hr.; hospital and surgical benefits to include dependents, the company paying 50 percent and employees 20 percent of the cost, while the company will pay 100 percent of the New York State Disability Insurance cost.

The contract may be reopened by either Hooker or the union for consideration of general rates of pay on the first and second anniversaries, and for general rates plus other monetary issues on the second and fourth anniversaries. Continuing over 40 years of industrial peace at the Hooker plant, the new five-year contract agrees to no strikes, slowdowns or lockouts.

Augmented vacation schedules give two weeks' vacation with pay at the completion of two years of service rather than three years as formerly. The regular schedule of three weeks' vacation after 15 years of active service, and four weeks after 25 years is maintained. A new feature of the vacation schedule permits postponed vacation time to be used during the following year.

Death-in-family benefits are extended to include parents-in-law; wartime military service benefits of one month's pay for inducted employees have been reinstated; liberalized arrangements have been negotiated for holidays not worked, call-ins, holiday pay, overtime and starting rates.

In addition to the new contract, Hooker will continue its group life insurance program and its complete retirement program, the latter having been in effect since October 1946. The pension plan has been revised so that an employee with 20 years or more of service will receive a minimum pension of \$100 a month including Social Security at retirement.

The Niagara Hooker Employee's Union is an independent union. It was certified by NLRB in 1945 as the sole and exclusive bargaining agent of the company's employees.

Three-year labor pact for Ohio chemical plant

UNPRECEDENTED—First three-year labor contract in Greater Akron's mass production industry history has been negotiated between the independent Allied Chemical Workers and the Columbia Chemical Division of Pittsburgh Plate Glass at Barberton, Ohio.

NEW ERA—Company and labor officials agree that the three-year contract will benefit Barberton. "It will mean more steady employment and increasing the possibilities for expanded employment due to any expanded operations that may be undertaken," declare Herbert O. Eby and Cecil Wright. Eby is general director of labor relations for Pittsburgh Plate and Wright is president of the union. More than 2,000 workers are affected by the agreement.

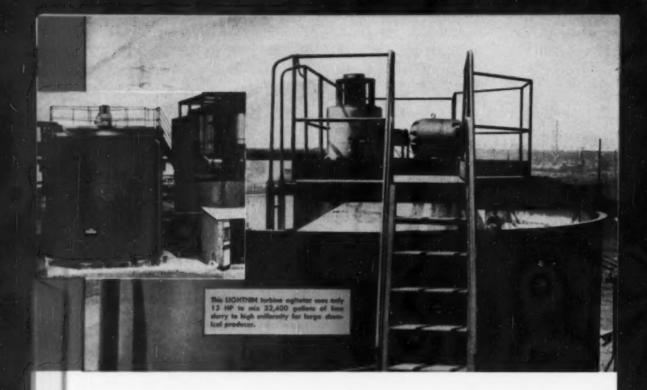
wages—Workers will get a 5-c. boost in the general hourly wage immediately, 5 c. more on June 28, 1951, and another 5-c. wage hike on June 28,

All provisions of the agreement will remain in effect during the three-year life of the contract. Long-term labor-management agreements have been signed in Akron before, but they provided for the wage question to be reopened in one year.

OTHER BENEFITS—In addition to the wage increase, the company has granted three-week vacations for workers with 20 years of service, improved shift differentials and increased group hospitalization benefits.

PENSIONS—A pension program providing for old age retirement and disability pensions for veteran workers who become unable to carry on their work also has been agreed upon by both sides.

ARBITRATION—A new feature of the arbitration procedure calls for a permanent panel of three (Continued on page 74)



SUSPENDING SOLIDS . . . a precision job

A LIGHTNIN Agitator, combined with MIXCO engineering, saves this large chemical company plenty on a "tough" solids suspension problem.

MIXCO agitation specialists showed this processor how he could suspend lime uniformly in an 18-foot, 34,265-gallon tank-using only 15 horsepower . . . with standard equipment . . . and without the cost or upkeep of a step bearing!

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That's why MIXCO is glad to take full responsibility for the success of every installation of LIGHTNIN Mixers.

If you are shooting for faster production, closer control, or reduced labor and upkeep costs, consult MIX-CO first. Check the processes you use, or plan to use, and write us for facts on agitation that does what you want it to do. Write today. Your letter will receive prompt, courteous attention by MIXCO engineers.

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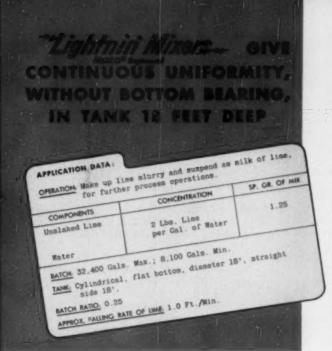




LIGHTMIN SIDE ENTERING MIXERS For tanks up to 5 million gallons. Geor motor or V-belt drive; motorless types. Sizes 1 to 25 HP, Send for Cotolog 8-76. LIGHTNIN TOP ENTERI AGITATORS Turbine, pro paddle types. For og or closed tonis, Sixter

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MIXCO Analysis: Laboratory work with a test model, operating in a transparent tank, indicated that a power input of 15 HP would suspend the lime satisfactorily, although tankage of this size would normally require 25 or 30 HP. The abrasive nature of solids made a step bearing impractical.

Solution: LIGHTNIN Model 3D-WQ-1500, 15-HP Turbine Agitator, providing output shaft speed of 59 RPM.

Two 38" multi-blade radial flow turbine impellers were selected, with lower turbine 12" off tank bottom to provide low-level operation. Upper turbine was carried proper distance above lower turbine, in an extended keyway to pesmit vertical adjustment to yield optimum results. Lower turbine was fitted with a correctly sized stabilizer ring, giving stable operation of the 18' overhung shaft, even during draw-off.

Pumping capacity of 188.2 Gals. per revolution for each turbine, when modified by the proximity factor, gave a total discharge of 18,000 GPM, equivalent to approximately one-half tank turnover per minute.

Results: High uniformity of suspended solids. There is no appreciable difference in lime content of the first and last thousand gallons drawn from tank. User is well pleased after more than a year's continuous operation.

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THE CHEMENTATOR, continued

arbitrators who will serve during the life of the contract. The union will name one arbitrator, the company one, and both sides will agree on a third each time a case is appealed.

Natural gas scramble in Northwest

How much Canadian natural gas would U. S. consumers in the Northwest be willing to purchase? On the answer depend the prospects for bringing Alberta natural gas to the industries of British Columbia in the next few years. For it is doubted that Alberta gas could be piped cheaply to Vancouver, B. C., unless, at the same time, much of the gas from Alberta can be sold in the U. S.

A top executive of Alberta Natural Gas Co. has told Alberta's petroleum and natural gas conservation board that a pipeline from Alberta to serve only British Columbia cannot pay its own way. There must be major outlets for the gas in the U. S. Northwest.

The battle among competing companies for authority to move Alberta gas westward is at a lull. No decision is expected in Canada before late this year.

Meantime, the possibility that such American companies as Pacific Northwest Pipeline Co., a Texas firm, may pipe gas into the Northwest and get the jump on the Canadians is worrying those who own Alberta gas. They fear the loss of a rich American market. The newcomer from Houston, Pacific Northwest Pipeline Co., seeks authority from the Federal Power Commission to string a 2,200-mi. gas line from the lower Texas coast into the Pacific Northwest at a cost of about \$180 million. Initially, the line would have a capacity of 250 million cubic feet of gas a day. Also contemplated is the purchase of an added 100 million cubic feet per day of gas from Canadian sources, the gas being brought into the main line that the American firm would lay into the Northwest.

Canadians in British Columbia are worried. For if American natural gas is brought into the Northwest before gas from Alberta westward is authorized, the loss of prospective consumption in the Northwest will discourage construction of a gas line from Alberta to Vancouver.

Fertilizers pay off for wheat farmers

To find out just how handsome a profit there is in fertilizers for the wheat farmer, soil specialist M. D. Weldon and his associates at the University of Nebraska applied nitrogen fertilizer both in the fall and spring to a test plot in Nebraska's Cass County.

Ten pounds of nitrogen was applied in the fall and 30 lb. of available phosphate and another 30 lb. of nitrogen were applied in the spring. The yield was 33 bu. of wheat. This is compared to an unfertilized field that made 20 bu. per acre.

A superphosphate application alone brought 27 bu.

in another plot. Nitrogen fertilizer alone produced a 23-bu, yield.

The conclusion that the combination of fertilizers was profitable is figured this way: The cost of 30 lb. of available phosphate is \$2.40 to \$3, while 40 lb. of nitrogen costs \$4.80 to \$6. At a market price of \$1.89 for No. 2 wheat, the 7-bu. increase in yield produced by about \$3 worth of phosphate made a profit of \$10.23 per acre. The 13-bu. increase resulting from applying \$9 worth of phosphate and nitrogen yielded a net profit of \$15.57 per acre.

Hydrazine: fuel for jet engines

Hydrazine is being tested by both the Army and Navy as a potential fuel for tanks, trucks and rocket engines.

Investigations are under way at the Aberdeen Proving Ground—the Army's Ordnance test station in Maryland—and by the Office of Naval Research in at least one naval research center.

Chemically, hydrazine is, of course, N₂H₄, and a nickel catalyst promotes its decomposition into nitrogen and hydrogen.

Physically, hydrazine is a clear, colorless fluid. Its density (1.011) is close to that of water. A strong reducing agent, soluble in water, it is somewhat corrosive and can be nasty to handle.

The Germans were interested in hydrazine as a fuel for jet engines in World War II. This use is the primary object of U. S. military research. But unsubstantiated reports have it that successful tests have already been made of hydrazine in internal combustion engines.

One U. S. firm, Mathieson Chemical Corp. of Baltimore, is supplying the Army and probably has enough on hand to sell commercially.

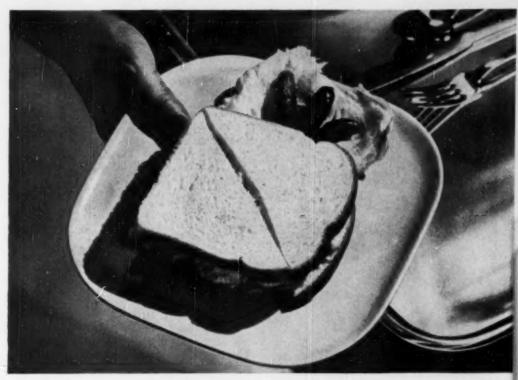
But there may be few buyers. Here are the disadvantages: hydrazine is \$4 to \$5 a lb.; gasoline, about 4 c. In addition, the heat value of hydrazine is only 38 percent that of gasoline.

Hence it seems highly unlikely that hydrazine will be much of a competitor for gasoline in internal combustion engines. Right now its use in jet engines, rather than piston motors, is the more promising. For this purpose, the new fuel has a distinct advantage: it burns fast.

Bastnasite: U. S. source of rare earths

A bastnasite deposit in California may free this country of its dependence on foreign sources for its requirements of the rare earth metals cerium and lanthanum. But first Molybdenum Corp. of America, which owns the bastnasite deposit in California's San Bernardino County, has to find out how rich it is. A 100-ft, shaft is being sunk now, from which crosscuts will be driven to two large veins.

If the ore turns out to assay high, Molybdenum (Continued on page 76)



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THE CHEMENTATOR, continued

Corp. may be sitting pretty with a deposit big enough to meet all U. S. needs.

Bastnasite is the fluocarbonate of cerium and lanthanum. Its importance as a source of cerium and lanthanum arises from the fact that Brazil and India have largely cut off their shipments of monazite sands to the U. S. Imports of monazite sand and other thorium-bearing ore totaled 4,980 short tons in 1943, fell to negligible amounts during World War II, rose to 3,686 tons in 1946 and again dropped to 2,397 tons in 1947, most imports in that year coming from Brazil.

Last year, a new company, Rare Earths, Inc., began separating monazite from deposits of heavy sands in the area around McCall, Idaho, and shipping the products to Lindsay Light & Chemical Co. at Chicago for extraction of uranium, thorium and rare earths.

Cerium, most abundant of the rare earth metals, is used principally to make pyrophoric alloys. However, cerium is getting more and more attention as an alloying agent for improving the high-temperature performance of magnesium and aluminum used in aircraft and in gas turbines.

Sulphur removal plant for Japan

Japan will soon get a chemical plant designed by U. S. engineers. Koppers has a contract from Nissin Chemical Co. of Osaka, Japan, to do the engineering on a liqu'd purification plant to remove sulphur from industrial gases.

Koppers engineers are hard at work on the project now. And complete engineering plans and drawings should be on their way to Japan shortly.

Nissin specializes in the manufacture of sulphuric acid, synthetic fertilizers and related chemicals. Japanese officials and U.S. authorities in Japan have given the Koppers project the green light.

Boon to makers of GR-5 and vinyle

A new hydroperoxide, latest offspring of Phillips Petroleum research, can be used as an oxidant or initiator to promote rapid emulsion polymerization of butadiene and styrene. It works with such redox and peroxamine formulations as those employing ferrous pyrophosphate and polyamines. Limited quantities are just beginning to trickle from Phillips research headquarters in Bartlesville, Okla. Phillips has christened its baby Diox 7; actually, it's tert-butylisopropylbenzene hydroperoxide in 50 percent solution in the parent hydrocarbon.

The new chemical is more active than other hydroperoxides hitherto used in rubber polymerization at low temperatures. Hence it takes less to start polymerization. Bulk polymerization of vinyl monomers also is accelerated by the new hydroperoxide.

In the pure state, tert-butylisopropylbenzene hydroperoxide is a white crystalline compound. The 50 percent solution now being marketed is semi-solid at room temperature but completely liquid above 110 deg. F. For a hydroperoxide, its relative stability is high; and it is soluble in certain organic solvents. Both the hydroperoxide and the solvent have low volatility, and the solution has a flash point of about 300 deg. F.

Syntheties burst soap bubble

Synthetic detergents now constitute one-third of all U. S. cleaning agents bought. USDA's Bureau of Agricultural Economics reports that the use of synthetic detergents is responsible for a halt in the upward trend in soap production.

Use of soap per person reportedly was 15 percent smaller in 1949 than in 1948. The continuing trend to synthetics will probably make 1950 the lowest soap consumption year since 1930.

Trade estimates are that during the first three months of 1950 sales of synthetics accounted for about 31 c. and soaps about 69 c. of each dollar spent for the two classes of cleaning agents.

Maryland orders action on stream pollution

The Maryland Water Pollution Control Commission has issued its first orders under the state's recently enacted water pollution control law. Pollution of the Potomac River is involved.

The city of Cumberland, the West Virginia Pulp & Paper Co. and the Celanese Corp. of America must all have specifications and contract plans for adequate waste treatment facilities prepared by next March 15. And these facilities must be in operation by Sept. 15, 1951.

By Sept. 15 of this year the commission wanted the city and the two firms to report plans for correction of their waste problems.

The Maryland commission says it has acted because of the "grossly polluted condition of the North Branch of the river and the need for a progressive program of abatement in the region."

ECA finances French and Italian plants

ECA is putting up \$18 million to finance construction of oil refineries and chemical plants in France and Italy. The French get two catalytic cracking units and a gas recovery unit to cost an estimated \$4.6 million.

Cracking and lube oil units at Rome and Milan are to cost \$1,534,000. One project, calling for \$4.5 million of ECA financing, will be the construction of an ammonium sulphate plant at Bagnoli in Italy. The plant is to produce 170,000 tons annually, using coke oven gas.

A \$7,348,000 project will include construction of a plant for the production of synthetic ammonia from natural gas in Milan. Its annual capacity: 60,000 metric tons.

-End

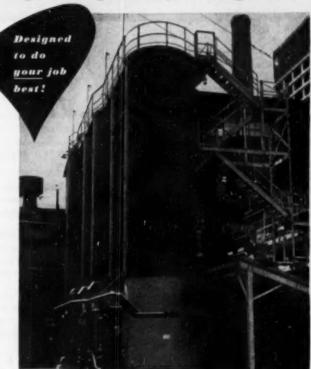


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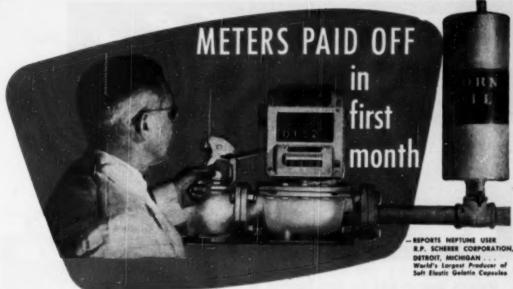
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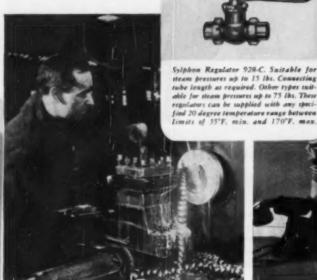
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4 Plants are Better Than 1

15 OF 20 ENGINEERS PREFER NICHOLSON TRAPS

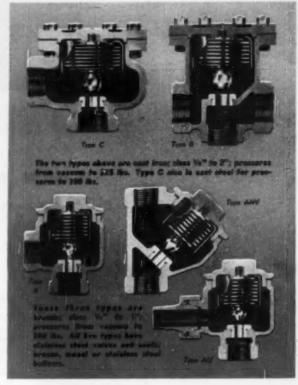
To determine the best steam trap on which to standardize, a large processing firm recently asked their plant engineers for their preference. In 15 out of 20 plants the choice was Nicholson.

The repeated adoption of Nicholson steam traps in plants currently in big "cost-reduction-through-modernization" programs is another indication of their advanced features. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic steam traps send for Nicholson catalog 250.

5 TYPES for Every Application

A survey showed these Nicholson features to be the leading reasons for the engineers' preference: 2 to 6 times average drainage capacity; shorter heat-up time. Operate on lower temperature differential; fast action keeps equipment full of live steam. Maximum air-venting capacity. Types for every process, power and heat application.

SEND FOR TRUP (atalog #250 Nichols of Trup (atalog #250 Nichols of Trup (atalog #250 Nichols of Trup (atalog newly revised. Describes freps for all mediums and pressures:—thermostetic and metal expansion for medium pressures; wight and piston operated for heavy duty. It pages; complete with capacity tables, installation disagrams, as well as a section containing date, charts and formulae for determining the prepar the frep for peetilic applications.



REPRESENTATIVE APPLICATIONS

Sterilizors.	Agital
Pans	Retort
Autoclaves	Cooks
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Tanks	Driers
Vats	Dry K

Molding Platens Calenders Unit Heaters Blast Coils Stack Heaters Radiators Convectors
Pipe Coils
Steam Mains
Headers
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W. H. NICHOLSON & CO.

206 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities

Sharkraft

Built to TAKE it!

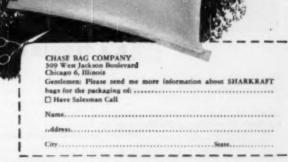
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Breakage is costly in many ways... to you, to your customers! All plies of Chase SHAR-KBAFT are crinkled to give "shock-absorbing" elasticity, assuring much greater resistance to breakage! The "shark-skin" crinkling of SHARKRAFT provides a sure grip—makes for easier handling and better stacking qualities. Available in choice of 2 to 5 plies. Furthermore, you'll find that the sharp, colorful printing and the attractive appearance of SHARKRAFT bags help stimulate the sale and acceptance of your product. Get the facts on this better container . . . Chase SHARKRAFT . . . mail coupon TODAY!

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flakes beta-naphthol

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all about our complete line
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processing machines.

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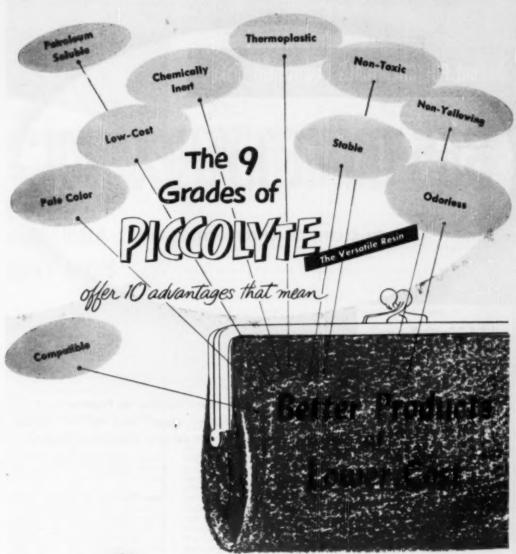
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Clairton, Pennsylvania

Plants at Clairton, Pa.; Wast Elizabeth, Pa.; and Chester, Pa. Distributed by Pennsylvania Falk Chemical Co., Pittsburgh 20, Pa. and Harwick Standard Chemical Co., Akron 5, Ohio Piccolyte puts money in your pocketbook, because of the opportunities for cost-savings and product-improvement it provides.

Not only is Piccolyte low in cost, but it is soluble in low-cost petroleum solvents, thus presenting you with a double saving. It is pale in color and stable; it is chemically inert, non-toxic and compatible with other resins and ingredients.

We will be glad to send you full information on this remarkable synthetic resin, and free samples. Please state the nature of your application, so that we can send a suitable grade.

Du Pont POLYCHEMICALS Department makes

355-TRIMETHYLHEXANOL

CH3C(CH3)2CH2CH(CH3)CH2CH2OH

3,5,5-Trimethylhexanol

Description: 3,5,5-Trimethylhexanol is supplied as a colorless liquid having a narryl alcahol content (by hydroxyl mmber) of over 97.5%. Irbois at 194°C. (381°F.) and freezes below -70°C. (-94°F.). Its specific gravity at 25/4°C. is 0.824 and flash point (open cup) 200° F.

The chemical properties of 3,5,5-Trimethylhenanal are those of a typical aliphatic alcohol. Its chemical reactions include esterification, dehydration, dehydrogenation, and reaction with halogen acids.

Uses—3,5,5-Trimethythexanol is used as an anti-foom in the leather, paper and textile industries . . . as an intermediate in the manufacture of plasticizers, tube aid additives and synthetic lubricants and as a froth flotation agent in mining.

Already Serving Several Industries, the Properties of
"Du Pont 3,5,5-Trimethylhexanol suggest many important new uses.

Can We Help You Use This and Other Polychemicals Products?

You should know that the Du Pont Polychemicals Department is a source of a broad list of industrial chemicals and plastics; and your Polychemicals' representative has technical knowledge of many of their industrial applications.

3,5,5-Trimethylhexanol is only one of the many alcohols available from the Polychemicals Department. Your Polychemicals' representative can give you or get you technical information on their uses as intermediates in the preparation of plasticizers, lube oil additives and synthetic lubricants, as froth flotation agents for

mining, and as anti-foam agents in leather, paper and textile manufacture.

Many Possible New Uses... The molecular configuration of 3,5,5-Trimethylhexanol suggests opportunities for its use in the manufacture of solvents for lacquers and other finishing compositions, as a modifier for alkyd resins... and many more. If you wish to investigate any that seem promising to you, ask your Polychemicals' man about them. He'll be glad to help you with any specific data available.



BETTER THINGS FOR BETTER LIVING

... THROUGH CHEMISTRY

Polychemicals

AND MORE THAN 100 INDUSTRIAL CHEMICALS AND PLASTICS

TECHNICAL BULLETINS AVAILABLE NOW on All Chemicals Listed Here for the Many Industrial Fields Served by the Polychemicals Department

It is quite possible that many of your questions about Du Pont 3,5,5-Trimethylhexanol and other Polychemicals' products are answered in technical data available. Or your Du Pont Polychemicals representative can help you get the answers. You can contact him through your nearest district office-350 Fifth Avenue, New York 1, N. Y.; 818 Olive Street, St. Louis 1, Missouri; 7 S. Dearborn Street, Chicago 3, Illinois: 140 Federal Street, Boston 10, Mass.; 845 E. 60th St., Los Angeles 1, Calif. For technical bulletins, write your nearest district office.

Is YOURS one of the many industries in which Polychemicals' products are used?*

ADHESIVES "Alathon" Polythene Resins • "Arboneeld" Urea-Formaldehyde Compositions • Du Pont Crystal Urea • "Hypalon" Synthetic Resins • Methanol

AUTOMOTIVE "Dehydrol-O" Denaturant • Methanol • 3,8,8-Trimethylhexanol • "Zerone" and "Zerex" Anti-Freezes

DETERGENTS Du Pont Crystal Urea • "Lorol", Fatty Alcohola • "National" Aqua Ammonia

DRUGS & COSMETICS Du Pont Crystal Urea • Dimethyl Sulfate • Methanol • Methyl Formate • "National" Anhydrous Ammonia • "National" Aqua Ammonia • "Lorol" Fatty Alcohols

DYES, COLORS, PIGMENTS Dimethyl Sulfate • Du Pont Crystal Urea • "Lorol" Fatty Alcohols • "National" Anhydrous Ammonia • "National" Aqua Ammonia

FINISHES Adipic Acid • "Arboneeld" Urea-Formaldehyde Compositions • Du Pont Crystal Urea • "Hypalon" Synthetic Resins • "Hytrol" Solvents • Methanol • n-Propanol • Nylon-Type 8

FOOD "Mycoban" Mold and Rope Inhibitor • "National" Anhydrous Ammonia • "National" Aqua Ammonia

INKS "Alathon" Polythene Resins • Dimethyl Sulfate • Du Pont Crystal Urea • Formamide • "Hylene" Plasticizers • "Hypalon" Synthetic Resins • "Hytrol" Solvents • Methanol • "Opalwax" Synthetic Wax • 3,5,5-Trimethylhexanol

LEATHER Hydroxyacetic Acid • "Hypalon" Synthetic Resins • "Lorol" Fatty Alcohols

MACHINERY "National" Anhydrous Ammonia • "Opalwax" Synthetic Wax

METAL5 Hydroxyacetic Acid • Methanol • "National" Anhydrous Ammonia

PAPER Adipic Acid • "Alathon" Polythene Resins • "Arboneeld" Urea-Formaldehyde Compositions • Du Pont Crystal Urea • Hydroxyacetic Acid • "Lorol" Fatty Alcohols • "Mycoban" Sodium and Calcium Propionate • "National" Anhydrous Ammonia • "National" Aqua Ammonia • Nylon-Type 8

PETROLEUM Diglycolic Acid • Du Pont Crystal Urea • Hydroxyacetic Acid • "Lorol" Fatty Alcohols • Methanol • "National" Anhydrous Ammonia • "National" Aqua Ammonia

PLASTICS Adipic Acid • "Arboneeld" Urea-Formaldehyde Compositions • Du Pont Crystal Urea • "Hexalin" Cyclobexanol • "Hylene" Plasticizers • "Hypalon" Synthetic Resins • Methanol • Nylon-Type 8 • Propionic Acid • 3,5,5-Trimethylhexanol • "Teffon" Tetrafluoroethylene Resin • Nylon Molding Powders • Polythene • "Lucite" Acrylic Resin

RUBBER Du Pont Crystal Urea • "Hypalon" Synthetic Resins • "Lorol" Fatty Alcohols • Nylon-Type 8 • "Opalwax" Synthetic Wax • 3,5,5-Trimethylhexanol

TEXTILES Adipic Acid • "Alathon" Polythene Resins • "Arboneeid" Urea-Formaldehyde Compositions • Du Pont Crystal Urea • Hydroxyncetic Acid • "Hypalon" Synthetic Resins • "Lorol" Fatty Alcohols • Methanol • "National" Aqua Ammonia • Nylon-Type 8 • "Tyze" Resin Textile Size

WOOD "Arboneeld" Urea-Formaldehyde Compositions • Du Pont Crystal Urea

"This is only a partial listing of the Polychemicale Department products which have applications in the industries shown here.

Department

E. I. DU PONT DE NEMOURS & CO. (INC.), WILMINGTON 98, DELAWARE



proven improvements in bubble tray design-

One truss for every two trays... with every alternate tray level free of major supports — this is the new bridge-type truss design that makes Gilbarco Duo-Level bubble trays faster to install, far easier to clean, and more rigid with lighter weight.

New cap assemblies are designed for quick, easy removal by one man working from the top side. There are no flanges or projecting edges around holes to slow up cleaning operations.

A new clamp design with improved packing protection minimizes joint leakage without causing distortion of the trays under temperature changes.

Duo-Level bubble trays, fabricated of alloy metals, are adaptable to refinery requirements either as new equipment or replacements. Gilbarco's large staff of engineers is at your

service to demonstrate how Gilbarco bubble trays can be fabricated to meet the requirements of your process design.

GILBERT &

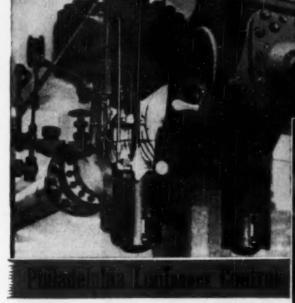
GILBERT & BARKER MFG. CO.

West Springfield, Mass. Toronto, Canada

Established in 1865

LIMITORQUE

PREVENTS



LimiTorque Control gives absolute assurance against improper seating, by means of a positive safety overload mechanical torque cut-out. If obstruction is met in closing valve, the torque switch becomes operative and disconnects the motive power.

Philadelphia LimiTorque Control will efficiently open and close globe, gate, butterfly and plug valves etc. by the "push of a button" at a remote or nearby control station. Handwheel is provided for rapid manual operation if necessary.

LimiTorque is readily adapted to any make of volve. Furthermore, it can be installed on existing equipment. Any available power source for operation may be utilized, electricity, oil, gas, water, air. LimiTorque can be supplied by any valve manufacturer.

Send for Catalog

Our LimiTarque Catalog is yours upon request. Please write on your business letterhead.

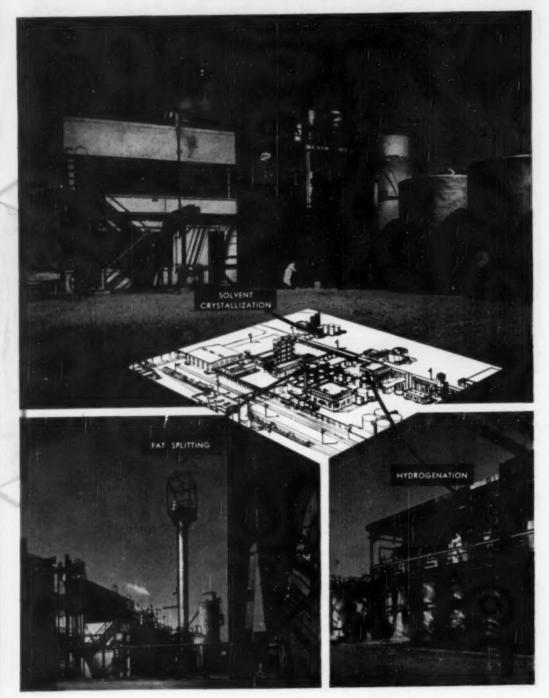


Philadelphia Gear Works, INC.

NEW YORK - PITTSBURGH - CHICAGO - HOUSTON IN CANADA: WILLIAM AND J. G. GREET LIMITED, TORONTO

> Industrial Gears and Speed Reducers LimiTorque Valve Controls

A New Process for Separating Fatty



September 1950—CHEMICAL ENGINEERING

Acids by Fractional Crystallization



ANOTHER BADGER FIRST

The Fatty Oil Fractional Crystallization Process utilizing solvents as a means of separating fatty acids offers the industry an opportunity to make a wide variety of products of high purity and excellent yield at low operating cost.

A new Fatty Acid Fractional Crystallization unit, engineered and constructed by Badger, is now in successful operation at Armour's McCook, Illinois, plant. This unit permits separations with solvent over a wide range of operating temperatures. As a result, a variety of charge stocks can be processed and products of widely divergent characteristics manufactured.

This is a part of Armour's integrated plant for processing of animal and vegetable fats, designed on the basis of developments and extensive experience of Armour and Texaco, and engineered and constructed by Badger with the exception of three specialized units furnished by others. Among the Badger-built units, as well as the crystallization unit, are installations for fat splitting, hydrogenation, refining and bleaching, product finishing and a boiler house, waste recovery system, tankage, warehousing and shipping, and all auxiliary facilities.

The Fatty Oil Fractional Crystallization unit is operated under license from the Texaco Development Corporation. Into this unit Badger has built the "know-how" of both Texaco and Armour. This is another example of Badger's unique ability to convert basic design of a new development into a successful commercial plant.



E. B. RADCED & SONS CO · Est. 1841

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Process Engineers and Constructors for the Petroleum, Chemical and Petro Chemical Industries



Example: Assure accurate timing of heating and cooling operations

If you are using fixed speed machines for your heating, cooling, baking, drying, cooking or chilling operations, you have a real and vital need for accurate, infinitely variable REEVES Speed Control. Here's why!

With the mere turn of a handwheel or touch of a beston, the operator can instantly obtain the speed that will assure the correct timing for each material or product in process, in conformance with its own special requirements. You get exactly the right finish, texture, temperature or consistency—and you get it without losing costly time for belt or pulley changes. You improve quality of production and rate of production . . . and you do it right now!

REVES Variable Speed Drives are easily and economically applied to any driven machine. Variations of the three basic REVES units are available in a wide range of sizes, designs, capacities and speed ratios, and with your choice of manual, push-button or completely automatic controls.

Survey your plant today. Wherever you have fixed apped machines, there, potentially, and very probably, is a place where REEVES can increase your production and year profits. Send right away for complete information, as contained in Catalog CE36-2-3N.





A representative application of Reeves Speed Control to assure accurate timing is illustrated above. The furnace pictured here is used for hardening the lenses of industrial goggles. Changes in heating time are necessary to the success of these operations, since the lenses are run in a wide variety of sizes. The furnace is equipped with a Reeves No. 20 Vari-Speed Motor Pulley (arrow) and Reeves Electric Tachometer, permitting accurate, positive speed variations. Operating at a temperature of 1700° F., the furnace heats each lens approximately 3 minutes. Average output for a single unit is 600 lenses per hour. For other time-saving, cost-cutting "tricks" performed by Reeves Speed Control, refer to the list below.

REEVES PULLEY COMPANY, COLUMBUS, INDIANA Recognized Leader in the Specialized Hold of Speed Control Engineering



Other Uses:

Handle more shapes, sizes and materials * Match skills of operators * Compensate for changes in character of product in process * Maintain uniform peripheral speeds * Maintain uniform pressure, temperature, liquid level, etc. * Regulate conveyer speeds * Synchronize parts of one machine or different machines speeding in series.

For easier, better welding ...

GRINNELL WELDING FITTINGS

A qualified welder can make welds quickly and easily with Grinnell Welding Fittings. These fittings are made by a hydraulic forging process that assures uniform wall thickness at all points and true circularity throughout. Of seamless, one-piece construction, they can be cut at any angle to match up with standard weight, and extra strong and heavier wall pipe in I.D. or O.D. sizes. Pressure-temperature ratings are equal to or greater than those of seamless steel pipe. Grinnell Welding Fittings are process stress-relieved.



Permanent Identification

Each Welding Fitting bears a metal plate giving size, wall thickness, material and name for easy, positive identification.



Full Longth Outlets

Full length outlets permit fast lining up and ample room for rod manipulation; keep high welding heat away from vital crotch sones.



Uniform Vall Thickness

Uniform wall
thickness at all
points permits
perfect lineup with
pipe, O.D. and I.D. No thinning of

pipe, O.D. and I.D. No thinning of long outer wall . . , no thickening of short inner wall. Complies with code requirements.



True circular section at all points makes fitting easy to align and weld . . . no distortion or flattening to affect flow adversely.



Plain Circumferential Butt Wolds

Grinnell Welding Fittings confine all welds to plain circumferential butt welds — with their inherent strength and simplicity.



Accurate Revalu

Accurate bevels aid aligning and welding. Standard straight bevel for thickness (T) %s to % inch inclusive. Standard U-bevel for thickness (T) greater than % inch.



True Included Angles

True included angles permit fabrication and erection of complicated piping systems to exact measurements.

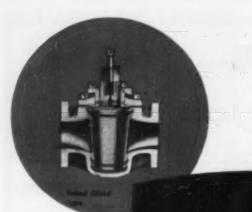


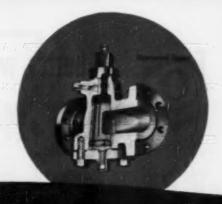
Send for copy of this new catalog showing the complete line of Grinnell Welding Fittings and Forged Steel Flanges.



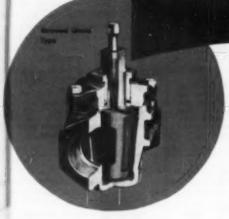
GRINNELL

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Bearing the burden of control ON THE Toughest LINES



A tapered, lubricated plug valve is superior to any other valve design for chemical lines-because its seat is never exposed to the line. In conventional valves the exposed seat eventually corrodes or erodes. In Nordstrom valves the plug is tapered to insure closely-fitted seat-ing. The seat is lubricated and will not gall. The ports are sealed with pressurized lubricant. The passageway presents a flush surface so that nothing in the line can lodge within the valve or intrude upon the seat. For handling extremely erosive fluids the plug and body seats are Merchrome coated with hard-facing. You can install Nordstroms on the hottest or the coldest lines and they will operate as efficiently as on normal lines. Special types of valve lubricants have been de veloped for specific chemical services. Use Nordstroms on every tough line in your plant for leak-free, corrosion-free performance.

LUBRICATION is a "must" to seat a valve tight

NORDSTROM VALVES AVAILABLE IN SEMI-STEEL, NORDCO STEEL AND ALLOYS TO FIT THE CHEMICAL NEED

4.4%, CREOMIUM—15%, MOLYBDENUM—an alloy steel of high physical properties which also possesses excellent resistance to corrosion and used mainly for high temperatures, particularly for petroleum refinery operations.

temperstative, parkthisary for performant remover operations.

Here ACT RESISTING ALOYS—for sub-zero temperatures. These are cast, low carbon nicket siles steels, specially head-treated for one at sub-zero temperature.

PURE NICKER—offers the best resistance of any of the common metals toward caustic alkalies and is particularly resistant against hot concentrated solutions of caustic sods.

MONEL—a high nickel alloy containing about 70% nickel, 29% copper and a small amount of iron and other elements. Its physical properties place it in the range of steels as regards strength and ductility.

range of steels as regards strength and ductility.

MHRCCLOY—a nickel bronse, very resistant to strong acid and alkaline solutions. It finds wide use in handling hot concentrated caustic solutions, refinery sludge acid and super-heated steam.

MH-HESIST—the cheapest alloy for mildly corrosive services. It is a cast from alloy containing nickel, copper and chromium. It is resistant to dilute sulphuric acid and other mildly corrosive agents. In certain types of technical service, particularly caustic evaporation, a copper-free Mi-Resist containing up to 30% nickel is being used.

nucket to being used.

STAINESS STREES—wide variety is available, the principal types containing about 18% chromium and 8% nicket, and that containing 12% to 18% chromium and 8% nicket, and that containing 12% to 18% chromium carbon content. The 18-8 along text ments soft appeals of the 18% of th

currosion and ermson.

MERCO SROVEZ -widely used primarily because of its natisfactory acid-resisting characteristics. It is a copper-tim-local bronze commonly referred to as an 98-1-3 Brenne. It has good resistance to sulphur disatide and sulphurous acid solutions, as well as weak sulphuric acid. It is suitable for services in aulphite pulp mills for handling self liquor: also for accide acid, sait water, etc.



ROTARY ACTION, MOST POSITIVE CONTROL

Simplest valve design is a tapered plug. When properly lapped and fitted, it forms a tight closure, but it must be lubricated to insure easy turning and tight sealing.



PLUG SURFACE SEATED ON LUBRICANT FILM

The Nordstrom valve employs pressurized lubrication which evenly distributes a film over the entire seating surface, which is never exposed to the line. Easy turning is assured.



POSITIVE PRESSURE SEAL AROUND EACH PORT

Nordstrom "Sealdport" lubrication, by ingenious locating of connecting grooves in the plug and body, forms a pressure seal around each port which prevents internal and external leakage

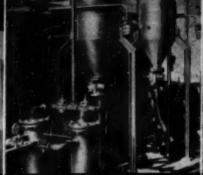


HYDRAULIC JACKING ACTION FREES PLUG

A few turns of the external lubricant screw regenerates pressure. If the plug is too tight to turn easily, a few extra turns of the screw hydraulically jacks the plug, freeing and lubricating it,



ON DIGESTER BLOW-DOWN LINES

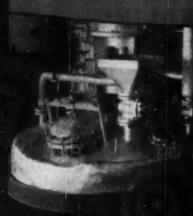


ON NAPHTHA SLURRY STORAGE SYSTEM



" ON A HOT VIRENISM DISIS





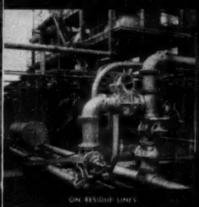
VALVE ON VARNISH COOKER



N WATER SOFTENING PLAN



MULTIPORT IN A WATER SCREENING PLAN



.....

Get this good habit... CHANGE TO A NORDSTROM EVERY TIME YOU REPLACE AN OLD VALVE

KEEP UPKERP DOW!

Nordstrom Valves

NOW AUTOMATICALLY LUBRICATED WITH &



ROCKWELL MANUFACTURING CO.

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Esport — Borkwolf Wify Co., interestional Division, Limpson Hude Building, New York I



YOUR **HEADQUARTERS** FOR SPECIAL **PROJECTS** BULK MATERIAL HANDLING

The above drawing shows a glass batch plant built by Fairfield for a national glass manufacturer. This 2000-ton plant has resulted in remarkable savings over previous handling methods. It has a mixing capacity of 43 tons per hour and car unloading rate of 60 tons. This tailor-made installation is one of hundreds successfully designed and built by Fairfield.

A A Fairfield offers construction service. Call

in an experienced Fairfield engineer for a practical and economical answer to your bulk material handling requirements.

Manufacturers of Belt, Screw, & Flight Conveyors Bucket Elevators . Skip Hoists . Tile Storage Silos & Steel Bins . Weigh Larries . Gates



Memo from the Editor

XVIII Seneci Per CMRA Honorare Sunt



Barbi Albi, Barbi Greyi, Barbi Niger-Omni Magna Cum Gusto Laudare Sunt



Pro Bono Industri-

Paperi Honorarorum

At its summer conclave, the Chemical Market Research Association honored the venerable among its members. CMRA, in recognizing service, switched the usual procedure. Instead of assuming the whiter the beard the greater the service, they figured the greater the service the whiter the beard.

White beards were handed out to three "venerables"—Richard L. Davies, Sidney D. Kirkpatrick and Robert B. Wittenberg. Back in August 1940, these men set themselves up as a committee of three "to look into the possible organization" of what's since developed into CMRA.

Grey beards were awarded to the "ageing 24" who responded to that first call back in 1940. They took part in the pre-organization meetings in New York and Washington. They made CMRA possible.

Black beards were given to the 78 "youngsters" who met in New York on June 8, 1945, for the actual setting up of the present CMRA. Then CM-RA had 78 members; now it has 220.

An award plaque (above) went with each beard. This papyrus orates as follows:

"Omnibus ad quos hac Litterae pervenerint, Salutem: S. D. Kirkpatrick post satisfactorili requirementes



Barba Typicalis-

Sidni D. Circpatric

passendum et exceptionaliam abilitatem demonstravit totam noctumalis upstavere, totam diem upstandere, verbosum verborum audire or sine snoribus dormire, ad enjoymentiam activitatium extra-curricularium kindredi spiritum et bonam societatem hominum allegedli educatiorum ad gradum HONORI BEARDUS GRAYUS admiserunt with all the rights (potestatibus), privileges (privilegiis), and immunities (immunitatibus) thereunto appertaining." Signed: Richard L. Davies, Beardus Blanche Primus; R. B. Wittenberg, Beardus Blanche Secondarius; W. M. Dennis, Beardus Blanche Tertiarius.

This papyrus, reverently framed, now hangs at the place of honor in Sid's office. With it are two precious clippings of the beardus grayus.

P. O. Says NO

Every once and a while somebody asks me, "Why don't you let us know when we can get reprints of your articles and reports? You used to do it, and it was helpful."

Sorry, but the Post Office has put a stop to that. Indirectly—but effectively. P.O. now tells us that's advertising. For example: a one-line reprint notice on our 48-page May process energy report (or anywhere in the same issue) would put that entire 48 pages into the eategory of advertising matter! How does that affect us?

Well, our mailing rates are based on (1) the weight of each issue, (2) how many pages are devoted to editorial and how many to advertising. The advertising fraction must bear a much higher rate. To pay a stiff rate on 48 pages for the sake of one line is beautiful economics for the P.O.—but simply prohibitive for us.* So we've had to discontinue those little notices about reprints.

*We already pay the higher rate on all our editorial pages announcing your new products, new equipment and new technical literature—because we say you can write in to us for more information. (That's advertising our services. P.O. rules!) Also on reviews of McGraw-Hill books (but not those of other publishers).

Two Worlds and a Wall

Two letters from chemical engineers in Germany came to me in the same morning mail. One was from Western Berlin, one from Eastern Berlin. They started their journeys within 20 miles of each other, yet they came from different worlds.

Russian Zone: "Much as we would like to have your magazine, we don't have the money . . . and whether we'd be permitted to read it over here is another question. What we really need is food. . . ."

Western Zoue: "American friends saved my wife and me from death by starvation. Now I want to show my gratitude by deeds. That is all—except that I also would like to contribute, even in a small way, to a better understanding of the peoples of the world. Please give me a chance."

4-Star for Next Month

Watch for our article on the most revolutionary development in the sulphuric acid industry in decades. A brand new and streamlined design, now in commercial use, that (1) does away with the drying of air, (2) eliminates the converter heat exchanger, (3) uses a new type of converter that pushes 100 persent efficiency, (4) uses absorbers that operate on the principles of evaporative cooling, (5) eliminates practically all the conventional cooling equipment used with the absorbers. That's plenty.



Let us help with your steel problems

In these critical times, the problem of steel procurement is more difficult than ever. That's why we'd like to assure you that all of us here at Ryerson are ready to help you as much as we possibly can.

Our telephone girls who take your call . . . our laboratory men . . . plant men . . . sales engineers . . . delivery men-all share the job of making every effort to serve you promptly.

Because of the national emergency steel shortages are inevitable. But it is possible that many of your requirements may be among the carbon, stainless and alloy steels we have on

hand for quick shipment. So for any steel need, contact your nearby Ryerson plant and we'll all work shoulder-to-shoulder to serve you.

PRINCIPAL PRODUCTS

CARBON STEEL BARS-Hot TUBING-Seamless & welded, rolled & cold finished

gles, beams, etc.

PLATES - Sheared & U.M. Inland 4-Way Salety Plate

SMEETS-Hot & cold rolled, many types & coatings

mechanical & boiler tubes

STRUCTURALS-Channels, on- ALLOYS-Hot rolled, cold finished, heat treated

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JOSEPH T, BYERSON & SON, INC. PLANTS AT NEW YORK . BOSTON . PHILADELPHIA . CINCINNATI . CLEVELAND DETROIT . PITTSBURGH . BUFFALO . CHICAGO . MILWAUKEE . ST. LOUIS . LOS ANGELES . SAN FRANCISCO

RYERSON STEEL

Chemical Engineering

SEPTEMBER 1950

The Cancer of Communism

We are witnessing a painful but necessary surgical operation. The body politic has slowly been infected with a virulent disease that seemed destined inevitably to create a major crisis. That it was to break out first in Korea came as a surprise to most of us. Yet all peace-loving nations of the world were soon convinced of the source of this communistic malignancy. Drastic action was needed for which, unfortunately, we were ill prepared. And now after almost three mouths, we are still uncertain as to the success of the operation. We wait anxiously, hopefully, for proof that once this Korean cancer is completely eliminated, the patient can recover health and strength to withstand future attacks wherever they may come.

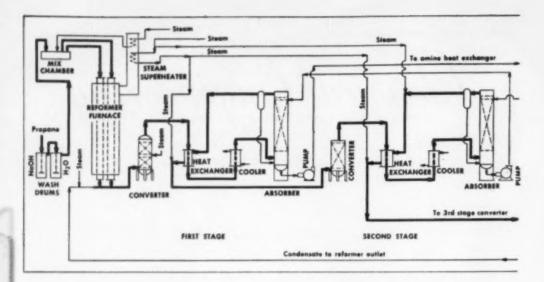
Our pathological parallel may not be sound in all respects. But certainly we are living in a very unhealthy world, with no assurance that even the best of doctors can prescribe the proper cure. Meanwhile, we in the United States must face up to a tremendous responsibility in the family of free nations. Our richest resources in men and money, in military and industrial potential, must again be mobilized for the possibilities of a major war effort.

We are just beginning to see the pattern of the job before us. More than one of our great chemical companies are being called upon to assume unsolicited assignments for national defense and industrial preparedness. There is a general tightening up of operations all along the line. Prices are firming as inventories are being built into strategic stockpiles. Already there is talk that several basic chemicals will be among the first commodities to come under governmental controls. Voluntary allocation and rationing schemes are being revived for chlorine and the alkalis, for benzene, toluene, and derivatives. The non-ferrous metals, paced by aluminum and copper, may soon be withdrawn from all but essential industrial uses. The hydrogen bomb project will demand more uranium, lithium and strategic materials of construction. New rocket fuels and missle propellants call for increased chemical production. And the need may soon be coming for more of almost everything we once made for a two-ocean war.

How well are we prepared in Washington to meet this emergency? Is the National Security Resources Board ready and equipped to assume leadership among the established governmental agencies that must mastermind industrial mobilization? Or will we flounder and fail until forced as we were in 1940 to set up a series of new super-agencies to stimulate war production and integrate it into our civilian economy? Until these questions are answered and these issues resolved, we may be wasting very precious time.

Some place back in the secret files of the military, there is supposed to be a super plan called "Operation Avalanche." If we are not mistaken it provides for rather wholesale applications of certain fissionable products and radioactive remedies thought to be effective in combating even the most malignant of cancers. To date we have regarded this solely as democracy's defense against unprevoked aggression. And it must remain so while every other means is marshalled to rid our world of the cancer of communism.

Didney Kirkpatrik



How Lookout Oil Gets H2 For

Elimination of a high-cost electrolysis method and introduction of the Hygirtol process has produced savings and eliminated an oxygen sales problem.

E. BALTON WHITE

Until recently, Lookout Oil & Refining Co. of Chattanooga, Tenn., made all its hydrogen by the electrolysis of water. Now it generates it from propane gas by the Hygirtol process of Girdler Corp.

An efficient electrolytic cell produces about 8 cu. ft. of H₂ per kwh., says superintendent C. L. Hunt. But his company prefers the propane process. It produces a 99.75-99.95 percent pure hydrogen gas at rated capacity, on a continuous basis and more economically. The firm converts liquid oils into margarine and hydrogenated shortening.

Basic reason in Lookout's decision to change from the electrolytic to the propane process was economic. However, at the same time there was a need for greater volume of hydrogen gas in hydrogenation operations.

In the electrolytic process the principal cost involved is the power cost. The cost even considering the very low local TVA rate averages between 0.75-0.85 c. per 1,000 cu. ft. of gas depending on the efficiency of the electrolytic equipment. This compares with the power cost in the Hygirtol process of approximately 0.25-0.30 c. per 1,000 cu. ft. of hydrogen gas. The labor cost and supplies pertinent to the hydrogen manufacture average about 20 percent cheaper per 1,000 cu. ft. with the Hygirtol process.

ELECTROLYTIC DRAWBACKS

In the electrolytic process oxygen is produced as a byproduct which must be sold and the return credited to the hydrogen gas cost. Otherwise production cost of the hydrogen would be prohibitive in this process. There are more efficient methods of manufacturing oxygen than by the electrolytic

process, such as the fractionation of air. Oxygen sales problems and need for more hydrogen led them to install this Hygirtol plant for the production of hydrogen gas using propane as a raw material.

HYDROGEN FROM PROPANE

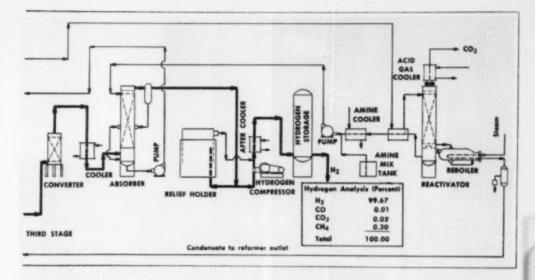
Hydrogen is generated at Lookout in a furnace where propane and steam are reacted to produce a mixture of hydrogen, carbon monoxide and carbon dioxide. Purification of this crude hydrogen is done in three stages. Each consists of converting carbon monoxide to carbon dioxide, followed by CO_a removal by the Girbotol process.

In the first conversion, about 90 to 95 percent of the CO is converted to CO₃. The second stage converts approximately 80 percent of the remaining monoxide. The third stage reduces the CO to approximately 0.005

percent.

The monoethanolamine solution used in the process passes through the three absorbers in series and finally to

E. Dalton White is Chemical Engineering's representative in Atlanta, Ga. He visited Lookout's plant to prepare this interesting and informative story for Chemical Engineering readers.



Its Hydrogenation Operations

the reactivator where the absorbed CO₀ is expelled by heat. The CO₀ is recovered and used as an inert gas.

Installed are two 25,000-gal, propane storage tanks and three 35,000-cu. ft. hydrogen tanks with pressure maintained up to 300 lb.

Atmospheric temperature is usually high enough that the liquid propane vaporizes naturally when released to the processing system. Only during severe cold weather is it necessary to use a steam vaporizer.

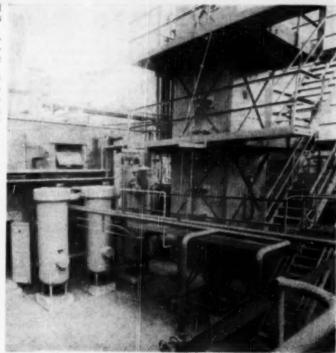
The sulphur content of the propane gas does not exceed a maximum of 15 gr. per 100 cu. ft. This sulphur is removed in a scrubber charged with caustic solution that is changed at frequent intervals.

The gas flows from the caustic scrubber to a water scrubber to remove any entrained caustic solution. From here it passes to the mixing chamber at the top of the furnace where eight parts of steam, at 20 psi, is added to one part of propune gas.

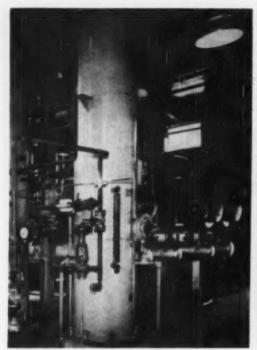
GAS IS REFORMED

Gas from the mixing chamber goes to furnace tubes, containing a nickel catalyst, which are maintained at 1,600-1,800 deg. F. by the combustion of additional propane in the chamber surrounding the tubes. Steam reacts with propane in the tubes.

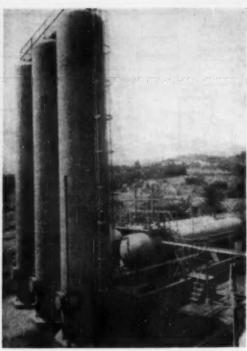
The resulting gas is 70-75 percent



Reformer furnace (right) is used to react steam and propane to yield hydrogen.







Three-stage coolers and two-stage heat exchangers in sear. Hydrogen is stored at 300 psi, in vertical tanks on left.

hydrogen, with the balance largely carbon dioxide and carbon monoxide with a trace of methane. This mixture is cooled at the outlet of the furnace tube to about 700-800 deg. F. by the addition of steam. It is passed into the first-stage converter which has two beds of iron oxide catalyst. There the CO, reacting with steam, is converted to CO, and the desired product, hydrogen.

UNE THREE ABSORBERS

From the converter the mixture goes through the first stage gas-to-gas heat exchanger and a water-cooled gas cooler. It is then piped to the first stage absorber where it passes countercurrent to a solution of monoethanolamine which absorbs the carbon dioxide. The gas passes back through the heat exchanger to reheat it before the second stage of conversion.

Three such stages are used in the process to produce the high-purity hydrogen. From the third stage the hydrogen goes through an Electrodryer where the moisture content is reduced to zero dew point. It then goes to the hydrogen storage tank.

The carbon dioxide is later expelled from the monoethanolamine solution in the reactivator by heat supplied in a steam heated reboiler at the base of the tower.

Analysis of the hydrogen shows 99.75 to 99.95 percent purity, the remaining being:

													F	ercen
Oxygen.	max.	. ,												0.001
Carbon	mono	Xic	de					0			0			0.00
Carbon	dioxid	le				0					0			0.003
Methani	and	ol	th	er	i	n	e	rŧ	H	g	a	56	55	0.039

The plant was designed for compactness and efficiency. It has a capacity of 150,000 cu. ft. of hydrogen per 24 hr. and is operated on a 7-day week basis. It requires only one operator per shift. The entire operations are controlled from a centrally located control panel.

CONTROLS ARE ACCURATE

Cas and steam flows are kept steady by a series of hand and motor operated valves. These controls are manually set by the panel operator, but once set they do not vary appreciably. Because of the extreme accuracy over control settings, only periodic checks are made by the operator on all settings. Resets are made manually when

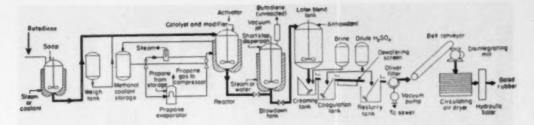
The rate of propane flow is approxi-

mately 10 percent of the amount of hydrogen produced. Hydrogen production can be varied between the economic limits of 1,000 cu. ft. per hour to a maximum of 6,250 cu. ft. on a continuous basis. The variable operating standard enables the company to keep the hydrogen output at a rate to correspond to the volume used in oil processing.

CATALYST LAST A YEAR

The reforming catalyst is changed on an average of about once every 12-18 months. During this change the plant is shut down for about 48 hrs., allowing time for thorough cleaning and inspection. The change of catalyst is generally made during a period of low production, with sufficient hydrogen gas stored so as not to interfere with oil processing.

While the plant was designed to give a minimum of 99.67 percent pure hydrogen, good operating practices and maintenance of careful and efficient control has enabled Lockout Oil to obtain up to 99.95 percent hydrogen. These results are due in great part to the maintenance of exact control over each stage of operations in the process,



Styreneless Rubber

First successful production of a polybutadiene rubber for tire treads comes as natural rubber prices soar and benzene, vital styrene raw material, is scarce.

A new synthetic rubber, made without critically short styrene, has been developed by Phillips Petroleum Co. in cooperation with the Office of Rubber Reserve. During June approximately 475,000 lb. of the new rubber, called polybutadiene or PB rubber, was produced in the Borger, Tex., copolymer plant operated by United States Rubber Co. for Rubber Reserve. This rubber was made to duplicate limited quantities of the material previously made by Phillips in its cold rubber pilot plant. Phillips technical men assisted in the production at Borger. Limited road tests indicate that the new rubber is superior to GR-S synthetic rubber; it is about as good as cold rubber for tire tread use, which, of course, means that it is superior to natural rubber.

"Skyrocketing prices of natural rubber," says President K. S. Adams of Phillips, "have rapidly increased demand for GR-S synthetic rubber, which is made from a mixture of butadiene and styrene. However, there is a critical shortage of benzene from which styrene is made. Consequently, the government has not been able to supply the demand for GR-S synthetic rubber."

The new rubber requires no styrene since it is made for butadiene. The production of butadiene, made from petroleum, can be increased in existing plants to meet the present heavy demand for synthetic rubber.

Previous efforts to make polybutadiene synthetic rubber commercially were unsuccessful because the rubber obtained was difficult to process and had poor physical properties. Polybutadiene rubber good enough for use in tires was finally obtained in Phillips Petroleum Co.'s laboratories by making it much softer than usual with a modified recipe and at moderately low temperatures.

In the new process, high abrasion furnace carbon black is mixed with the polybutadiene latex before con-version to solid rubber. The PB rubber process is relatively straightforward and can be carried out in conventional production lines for cold rubber. In capsule, here's how the process works. Butadiene is mixed with soap and run into a jacketed reactor cooled with methanol. In the refrigerated reactor, butadiene is polymerized at 86 deg. F., using an activated recipe similar to the well known cold rubber custom recipe. The reaction takes about 10 to 12 hr. Next. the material is blown down under Since no styrene is used,

the monomer recovery or stripping step is greatly simplified, and it would be expected that production of 86 deg. F. PB rubber could considerably exceed GR-S production in similar equipment. Thus PB rubber may help relieve the synthetic rubber shortage through decreased requirements for styrene and through increased capacity in the copolymer plants.

After blowdown, the latex is blended with antioxidant, creamed in brine, coagulated in dilute sulphuric acid, dewatered, reslurried and filtered. Then it is conveyed to a disintegrating mill, from which it goes to a circulating air dryer. Finally, it is baled hydraulically.

One of the best features of the new product is its outstanding processing characteristics. It can be mixed and extruded at lower temperatures and with lower power requirements than GR-S, cold rubber or natural rubber, and it is unusually safe from the standpoint of scorch characteristics. It is believed that the new product will have its greatest utility in tire treads, probably in blends with cold rubber.

PB rubber, then, is a butadiene polymer prepared at 86 deg. F. to a Mooney value of about 25 and latex masterbatched with IIAF black (Philblack O). It represents the first successful effort to produce a polybutadiene rubber suitable for commercial use in tire treads.



Birthplace of PB rubber is this Bartlesville, Okla., pilot plant of Phillips Petroleum Co.

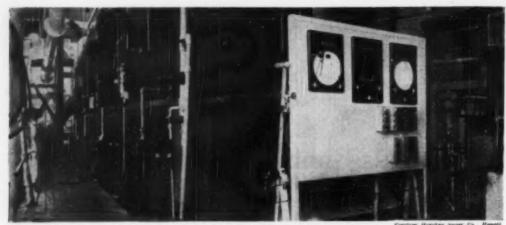


Fig. 1—Centralized control panel at the discharge end of this quadruple-effect sugar evaporator permits rapid check of operating efficiency of integrated control system. Note individual level controls beside each body along the catwalk.

Control of Multiple-Effect Evaporators

Balancing the performance of a multiple-effect evaporator through integrated automatic controls can be a straight-forward engineering operation based on the common sense of supply and demand

ARCH C. CAMP and LLOYD E. SLATER

Control instruments can be applied to a process hapazardly—or in studied fashion. Unfortunately, many of the "control systems" we see in process plants today are symbolic of the former approach. This occurs mainly because the particular process was established well in advance of the modern science of instrument application. Measuring and controlling devices were utilized only as each annoying variable appeared to taunt the process engineer.

Multiple-effect evaporators pre-date even the most rudimentary offerings of the early instrument industry. Consequently, this important unit operation has long suffered the check-leash of haphazard instrumentation and it is only in recent years that intelligent attempts have been made to integrate a system of automatic controls into its unusual dynamics.

ARCH C. CAMP is instrument apecialist for the Honolulu Iron Works Co., in Hawaii, while LLOYD E. SLATER manages the food industry division of Minneapolis-Honeywell's Brown Instruments Division at Philadelphia.

The primary purpose of applying controls to an evaporator station, as indeed to any other unit industrial process, is to increase the uniformity of product and at the same time simplify and reduce the human supervision required. There are a number of possible variables influencing the performance of a multiple-effect evaporator which must be dealt with by a control system. These, basically, are:

Quality of incoming liquor.
 Density of incoming liquor.
 Steam pressure to first effect.

 Vacuum variations in last cell.
 Amount of vapor taken from the first and succeeding effects for heating at other points in process.

In addition, there is the problem of variations in the supply of incoming liquor to the evaporator. This problem is especially acute in plants where extracting or grinding rates ahead of the evaporator may fluctuate due to difficulties in raw material supply.

Our basic control problem then is

Our basic control problem then is to insure that a uniform product leaves the last cell of the evaporator despite any or all of these variables. Since a smooth and balanced evaporator is also an objective of our system, this basic control problem can be further restated as two fundamental and interdependent approaches:

 Proportioning the amount of steam supplied to the evaporator to the amount of water that must be evaporated from the product.

Limiting the rate at which the product flows through the evaporator to the evaporating capacity of the station with the available steam.

Both these approaches are dedicated to the production of a uniform density concentrate. The former, however, is concerned with variations in the product supply and the latter with variations in steam supply to the evaporator. Our control system, to accomplish its objective, must be capable of dealing with both at the same time.

BASIC INSTRUMENTATION

In setting up the basic instrumentation for this process our primary concern would naturally be a means of evaluating the end results—product density. With this in view, a density unit is installed in the discharge from the last cell. This measurement will allow our density controller to permit passage or reject the flow of liquor from the evaporator in accordance with its specific gravity. Low density concentrate will thus be recirculated back into the evaporator until discharge from the system is no faster than is necessary for proper evaporation.

The first question that might be asked is why the density controller on the last cell could not control the steam supply instead of the product discharge rate. The answer is that it could, but the results would not be satisfactory. It has been found in a quadruple-effect evaporator, for instance, that approximately 15 min. clapses between the time that the density controller calls for a change in steam conditions and the time that the change in steam conditions is reflected in a change in density from the last cell. This long lag may throw the system out of balance and cause severe hunting, and an uneven product.

The next instrument we install, therefore, is designed to take care of this steam factor directly and reduce the effect of the time lag imposed by the evaporator. This instrument's function is to measure the product supply to the process, and proportion the steam to the first evaporating body in accordance with this measurement. This control, in effect, matches the evaporation rate to the product supply rate. The term "rate" applied to the product supply must be used in its broadest sense, including quantity, density, and temperature.

Our third basic consideration is that of liquid level in the individual bodies. Since a pressure differential exists between the several effects, some means of controlling each individual

level must be provided. Also, harking back to our first basic instrument, the density controller which will recirculate material back into the evaporator on low specific gravity-this need is even more emphasized. Excessive product in the last effect, as a result of this recirculation, will, through action of a level control, retard the feed to this effect. It is easy to see the necessity for a similar chain reaction down each cell of the evaporator. What will result, through the action of these level controls on each individual body, will be a slowing up in the flow of product through the evaporating system until it is no faster than necessary for proper evaporation.

Our basic evaporator instrumentation, therefore, involves three distinct control functions:

Product density from last effect.
 Proportion of steam flow to product flow in the system.

3. Maintained product level throughout the system.

If the instruments applied to perform these three functions do their job we should be well on our way to optimum evaporator performance.

AUXILIARY INSTRUMENTATION

While the basic instrumentation just described will take care of the majority of variables normally occurring in a conventional evaporating station, there are several auxiliary instrument techniques, or refinements, which can be incorporated in our control system to deal with other less discernable circumstances.

An efficient evaporator, guided by our basic control system, will be one which allows very little recirculation of liquor back into the last evaporating effect. Normally, the steam-to-product flow adjustment would establish an optimum performance from this standpoint. However, the density of a liquor is also influenced by its temperature, this in turn being a function of the constancy of vacuum maintained in the system.

An absolute pressure controller, therefore, can be utilized to measure and automatically stabilize the pressure in the last effect by regulating a control valve on the condenser water. Such an arrangement will not only make for smoother performance of the control system but will also achieve considerable water savings at times of reduced evaporating rates. Only as much condensing water will be used as is necessary to condense the vapors.

Another complicating factor enters the picture in those plants where vapors are "robbed" from the first and succeeding effects of the evaporator to supply steam to other operations. Under such conditions the first effect can be likened to a steam generator or "boiler" using exhaust steam as a heat source and dilute product liquor as "feedwater." Since other operations are dependent upon vapors from this effect, it is evident that the product feed must be augmented with water whenever its supply is low. To accomplish this an automatic valve is installed on a water supply line to the product feed tank. When energized at a predetermined low level by the instrument measuring product supply, this valve will open and assure a steady production of vapor for the plant.

In some plants it occasionally happens that the amount of water to be removed exceeds the evaporating ability of the station with the available

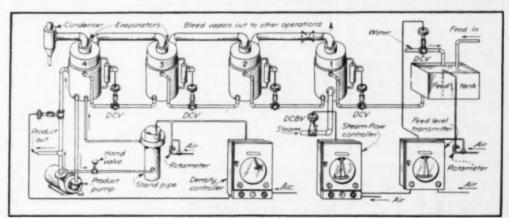


Fig. 2—Integrated control system for parallel-flow multiple-effect evaporator. Two instruments at right proportion steam to product. Product density is regulated by control instrument at the left working in conjunction with the sampling standpipe and recirculation control valve. Each effect has its own level control.

steam. To meet this condition, operations ahead of the evaporator often have to be slowed down—usually with a good deal of difficulty. However, it is possible to allow the feed supply measuring instrument to re-set the control point of the density controller pneumatically to compensate for such conditions. Through this action the concentrate density will be lowered automatically just enough to allow efficient evaporation to occur with the reduced supply.

While the above are a few of the more common control system refinements designed to meet some of the varied problems of in-plant evaporator operation, many other instrument techniques are available to deal with the most nebulous situations.

THE WORKING SYSTEM

With the aid of Fig. 2, illustrating the instrumentation of a quadrupleeffect forward-flow unit, we can make a more detailed examination of the mechanics of our basic evaporator control system.

Starting with the arrival of product at the supply tank, we can follow the operation of the controls. The depth of the liquid in this tank—an indication of how fast the process is being supplied with feed—is determined by a pressure measurement of an air col-

umn continuously bleeding into the tank. Variations in level are reflected by variations in the air pressure required to overcome the hydrostatic head in the bubbler tube.

The supply level transmitting instrument is linked pneumatically to a second instrument which is designated as the steam-flow controller. The indicating pointer of this controller is, therefore, positioned in accordance with supply tank level, and the instrument in turn controls an air operated butterfly type valve in the steam line to the first effect, or to the second if vapor is robbed from the first. In this manner, deviations from the optimum steam-to-product ratio will result in adjustment of steam to the process in accordance with its new demands. As the product rises or falls in the supply tank, the butterfly valve opens or closes, admitting more or less steam or The two instruments together accomplish the proportioning of steam flow to product flow referred to in the basic system.

An additional refinement in the system, at the supply tank, is an automatic water make-up valve used when vapors are to be robbed from one or more effects. An extra control built in the supply level transmitter is set to cause this valve to open when the tank reaches a certain low level, there-

FIG. 3-THREE WAYS TO CONTROL LEVEL

 FLOAT TYPE—Float on lever rides surface of liquid. As liquid level changes, float lever rotates shaft, operating air pilot valve and transmitting variable air pressure to diaphragm control valve. This regulates liquid entering vessel, allowing simple throttling only.

2. DISPLACER TYPE — Cylindrical displacer, is supported partially submerged in liouid on a lever. Liquid buovancy exerts force tending to rotate shaft connecting to force balance unit through fukrum point. Through air pilot valve movement changes pressure on control valve and also on restoring bellows. Latter opposes movement of displacer and returns it to original position regardless of liquid level. Pressure measures level.

3. DIFFERENTIAL PRESSURE TYPE
—High and low pressure connections
of differential pressure instrument are connected to vapor space and below minimum
liquid level. Changes in level after differential pressure, operating air control mechanism and in turn controlling valve in
liquid supply line to maintain constant
level.

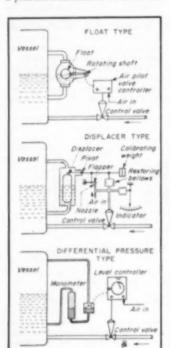
by maintaining a minimum liquor supply when feed is too slow.

In order to determine discharge product density, some of the liquor being pumped from the last effect is circulated through a stand-pipe for an air-bubbler type measurement. As in the case of the supply level transmitter, the pressure developed on a continuous-bleed air system introduced into this product column is a function of the hydrostatic head at the bottom of the tube. In this application, however, two dip tubes are submerged at a fixed vertical distance apart in the column, and these, in turn, are connected to the high- and low-pressure sides of a differential manometer type of instrument. In this manner, any variation in pressure aside from the basic minimum differential pressure is due to changes in density of the liquor. Should liquor density fall below the set-point of the manometer-type controller, an air operated valve opens in the recirculating line and allows product to pass back into the last effect.

The liquid level measuring device on each effect consists essentially of a vertical chamber which is piped into the side of the cell so as to be partially filled with product. A displacer is suspended by a lever in this tank and the buoyant force which it exerts, a direct function of fluid head, is measured by a non-indicating pneumatic controller which positions a diaphragm operated control valve on the feed line

to the cell. In order to realize the full integration of these controls let us start with a change in discharge product density and follow the movements of the system to correct for this. Should the density fall, the density controller will recirculate some of the product back to the last cell-the amount being proportional to its deviation from optimum density. The increased level in this cell will cause its level control to throttle down the supply of incoming product. This reaction will occur down the length of the evaporator through each effect with the change in demand for product at the supply tank thereby decreasing. At this point, level in the supply tank rate will rise, causing more steam to be admitted to the first effect through the action of the steam-to-product proportioning system. The admission of more steam will result in a faster evaporation rate in the system with the ultimate balanced production of the thicker liquor which has been originally called for by the density controller.

While the foregoing explanation would seem to indicate that a rather long-drawn-out chain of events must



occur between measurement of a density change and final control by the system, actual field results provide an average product of density which is always within 0.004 sp.gr. The secret of this control lies in the wide-band throttling action of the system. All valve adjustments-recirculation, liquid level and steam flow-are of the gradual type, involving small valve movements for small increments of measurable change. Consequently, a smooth, constant readjustment of the process to tiny changes is always in effect rather than the infrequent, sizable control movement which is characteristic of "on-off" or narrow-band type of control.

CLOSE-UP OF CONTROLS

While specific instruments and devices have been described in our working control system, there are many other types of control equipment which can be substituted as components. Selection of the correct instrument type, however, is a study in itself. In evaporation, control equipment selection depends primarily on the product being handled, but is also strongly influenced by the design and layout of the actual evaporator.

A good example of the problems of instrument selection is provided by the density measurement needed in our evaporator control system. This measurement could be made with a variety of systems which could involve, for example, boiling point elevation of product in the last cell, balancing of a column of product against a column of water, a displacement type density measurement or even-through inference-by a viscosity measurement.

The unit described in our system was designed primarily for service on fairly viscous liquids where evaporator scaling is a problem and where ease of maintenance is desired. The single standpipe using two bubble tubes and built-in instrument suppression, climinates the need for a water column or regulated air pressure reference. Further, the system will act completely independent of product level as long as the two pipes are kept submerged.

The displacement type density system is even simpler from a maintenance standpoint, since it does away with the need for an air bubble supply and often can be located directly in the process stream without the necessity for a separate sampling line. The limitations of this simple and fairly accurate measuring means are its unreliability on highly viscous liquors and its need for a clean product. Any scale or similar solid impurity in the

SUBBLER TYPE DISPLACER TYPE transmitte Temperature Differential temperature recorder

product will tend to coat the displacer and throw the unit out of calibration.

By far one of the most precise techniques for gaging liquid density involves boiling point elevation. This scheme relies upon the fact that the boiling point of a solution increases with the amount of dissolved solids, the pressure remaining constant. To achieve this in an evaporator, one bulb of a two-bulb differential electronic instrument is placed in the free-boiling product and the other located in a small pilot pan, connected to the evaporator vapor space and containing water boiling at the same vacuum as the product. Electrical subtraction in the instrument permits a direct reading of boiling point rise which can, in turn, be correlated with the product density. While highly accurate, this system is used less often than others because of its higher cost.

Another point in the evaporator involving the problem of instrument selection is the level control system required on each effect. The three most widely used methods for this are the constant-displacement type or float controller, the variable-displacement or force-balance type controller and the differential manometer. The float controller is the simplest and least expensive, but requires considerable maintenance and provides only a lim-

Fig. 4-THREE WAYS TO MEASURE DENSITY

- 1. BUBBLER TYPE Manometer equipped with float for measuring differential pressure has high and low pressure connections to two tubes immersed at calculated fixed depths in liquid. Air is admitted to tubes at fixed pressure. Dif-ferential pressure varies as liquid density varies, float movements recording density on calibrated chart or scale.
- 2. DISPLACER TYPE-Displacer is completely submerged in flowing liquid. Buoyancy of liquid, which is related to its density, tends to rotate shaft connecting to force balance unit, thus changing pressure on control valve and also on restoring bellows. Latter opposes movement of displacer and returns it to its original position regardless of density changes. Pressure measures density.
- 3. BOILING POINT ELEVATION-One bulb of differential temperature measuring instrument is immersed in boiling solution, with other bulb immersed in water boiling at same pressure. Temperature difference is measure of liquid density, inasmuch as boiling point eleva-tion is related to dissolved solids content of solution.

ited adjustment in its throttling range. The force-balance variable-displacement unit is a new development and offers a pronounced advantage in its easily adjusted level control point and throttling range. The use of this latter unit is usually restricted, however, to a range of level adjustment of 3 ft. or less in order to keep its proportions and cost within reason. The differential manometer provides the most flexible means of level control. It can be located at any point with respect to the effect being controlled and can be selected for any range of level measurement. Its limitations are its comparative costliness and need for greater skill in its maintenance.

The automatic valve requirements of a multiple-effect evaporator are rather unique. The difference in pressure between cells poses the problem of tight valve shut-off to prevent a drain through the system at times of evaporator stoppage. Further, product leaving one cell is at a lower pressure. and flashing can thus occur in the valve body. If this flashing occurs on the upstream side of the valve port, the resulting vapor uses part of the port area, thereby restricting the flow of product. Under such conditions an increased port area and high-lift character is needed in the valve to pass sufficient product.

SIZING PROCESS EQUIPMENT

By Statistical Methods

Factors of safety in process equipment design are largely arrived at by hunch. Here is a method which approaches the problem through mathematical consideration of the known uncertainties.

Standard deviations from average

Fig. 1—Normal probability curve shows how related data tend to distribute about the mean value. Curve plotted from table on opposite page.

PAGE S. BUCKLEY

One of the major problems confronting the designer of chemical process equipment is how much of a safety factor to use. In other words, after the size has been calculated according to standard methods, how much additional size must be provided to take care of uncertainties in the method of calculation and in actual process conditions? From experience designers have learned that a certain amount of oversize is needed, but opinion varies widely as to just how much. For example, the writer has known some designers who use a consistent 15 percent safety factor for heat exchangers while others use 100 percent.

Although the larger the safety factor used the higher the probability that the equipment will be at least adequate (large enough and possibly oversized), economic factors must be taken into consideration. Any unnecessary capacity, size, strength, or number of plates (as in a fractionator) can be regarded as unnecessary capital investment. It means higher costs and less profits. Therefore, the designer must strike a compromise between the risk that equipment will be inadequate and the chance that investment costs will be excessive.

One approach to the selection of design safety factors is by means of statistical methods. These methods, based on the mathematics of probability, provide quantitative evaluation of the uncertainties which make necessary the use of safety factors in the first place. They then permit direct calculation of safety factors for any desired level of assurance or probability that the equipment will be at least adequate.

Although some of the mathematics may appear formidable at first glance, the operations can readily be performed by any chemical engineer who has access to a table of differentials and a table of areas under the normal probability curve. The method assumes

that uncertainties will follow the normal probability curve, and while this may not be strictly true it is a suitable assumption to make in the absence of positive information to the contrary.

Before going on to show how probability principles are used, it will be well to review briefly both the normal probability curve and the standard deviation, sigma. The probability curve, Fig. 1, is a plot showing how a large number of test results or other similar data will tend to distribute themselves about the mean or average of all results. It can be plotted from the first two columns of Table I, which is skeletonized from tables available in various books on statistics. If we take the entire area of the curve from + oc to -∞ as unity, then the third column of the table (for half the area, on one side of the mean) will show the proportion of the total area existing at various horizontal distances from the mean. (Some tables show values under the entire curve.)

Concerning sigma, the standard deviation, it will not be necessary here to discuss its mathematical significance

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Table I-Ordinates and Area Under Normal Probability Curve for Half the Curve

(S'-S)/a	Frequency	Area
0	0.3989	0
0.1	0.3970	0.0398
0.2	0.3910	0.0793
0.3	0.3814	0.1179
0.4	0.3683	0.1554
0.5	0.3521	0.1915
0.6	0.3332	0.2257
9.7	0.3123	0.2580
0.8	0.2897	0.2981
0.9	0.2061	0.3130
1.9	0.2420	0.3413
1.1	0.2179	0.3643
1.2	0.1942	0.3849
1.3	0.1714	0.4032
1.4	0.1497	0.4192
1.0	0.1295	0.4332
1.6	0.1109	0.4452
1.045*	0.1082	0.4500
1.8	0.0940	0.4554
1.9	0.0790	0.4641
2.0	0.0540	0.4772
2.1	0.0440	0 4821
2.1 2.2	0.0855	0.4951
2.3	0.0253	0.4893
2.3 2.4 2.5	0.0224	0.4918
2.5	0.0175	0.4938
2.6	0.0136	0.4953
2.7	0.0104	0.4965
2.5	0.0079	0.4974
2.9	0.0000	0.4981
3.0	0.0040	0.4967
3.1	0.0033	0.4990
3.2	0.0004	0.4993
3.3	0.0017	0.4995
3.4	0.0012	0.4997
3.5	0.0009	0.4998
3.6	0.0006	0.4998
3.7	0.0004	0.4999
3.9	0.0003	0.4999
4.0	0.0002	0.5000
4.46	0.0001	0.5000

^{*} Interpolated value used in examples.

in detail. Geometrically, sigma is the distance to the right or left of the "average" axis at the points of inflection of the curve. Sigma may be regarded as a unit of uncertainty. Since area under the curve represents probability, it is probable that 68.26 percent of all data in a given group will fall within a range of deviation from the mean of plus or minus sigma. Also, as the diagram shows, 95.42 percent of the data will fall between plus and minus 2 sigma, and 99.73 percent between plus and minus 3 sigma.

To be the curve down to the case in hand, if a piece of equipment were built to meet only average conditions (with its design represented by S, the mean) then there would be a probability of 0.5 (50 percent, or 50 chances per hundred) that it would be inadequate, and a probability of 0.5 that it would be at least adequate. In other words, the area under the curve from - or to S is 0.5, and from S to $+\infty$ is also 0.5. An amount of overdesign, which may be designated S' -S must be added to S in order to provide a higher level of assurance than 50 percent that the equipment will be at least adequate.

In developing a method of equipment sizing with the aid of statistics, we have first to determine what the uncertainties in the design are, then what added capacity we must build into the equipment to give a desired level of assurance that the equipment design will be at least adequate. This means that we must first determine sigma, the overall uncertainty, or standard deviation, resulting from all the individual uncertainties; then for sigma and the desired level of assurance, as shown by the probability curve, calculate the necessary oversizing,

The principles may be outlined as follows: S is the equipment size, which is a function of several variables such as xi, xa, . . . xa. Then if eas is the uncertainty in any term x., the expression 10. represents the uncertainty in S due to the uncertainty in x., which is equal to (\delta S/\daranta x a) \sigma_{et}. In words, the rate by which S changes as x, changes, into the uncertainty in x,, is equal to the uncertainty in S due to x.

Finally, it can be shown' that the over-all uncertainty o, equals the square root of the sum of the squares of the individual uncertainties, or:

$$\sigma_4 = \sqrt{a_1 \, \sigma_0^2 + a_2 \, \sigma_0^2 + \dots \, a_n \, \sigma_0^2}$$

Now, as we have already seen, if the numerical value of S is obtained for average conditions, there will be an added value S' -S which will give the desired level of assurance that the equipment will be at least adequate. If the level of assurance is stated in terms of the fraction of the area under the probability curve (where total area is unity), then the proper total size S' can be determined by finding from the probability table that value of - S)/o, which will give the required area.

Now to consider a specific example: Assume that a counterflow heat exchanger is to be designed to heat 25,000 lb./hr. of an organic liquid from 100 to 175 deg. F. Its specific heat is 0.90 ± 0.05 Btu./lb. (sigma= 0.05). The heating medium is another organic liquid which enters at 200 deg. F. and leaves at 180 deg. F. Its specific heat is known precisely to be 0.86 Btu./lb. We shall assume that U, the overall heat transfer coefficient, has been carefully calculated and is 55 ± 5 Btu./(hr. ft.º deg. F.), sigma being about 10 percent for this sort of coefficient.

There are two uncertainties that will affect the amount of heat transfer surface required, the first being in the specific heat of the first liquid, and the second, in the overall heat transfer coefficient. The first of these affects the amount of heat that must be transferred which, based on the liquid to be heated is $Q = WC\Delta t$ or 25,000 × 0.90 × (175 - 100) = 1.69 × 10° Btu./hr. plus or minus an uncertainty due to the specific heat. The uncerthe to the specific heat. The undertainty $.\sigma_0$ is equal to $(\partial \mathcal{D}/\partial C)\sigma_n$, which equals $(\mathcal{Q}/C)\sigma_n = \mathbf{W}\Delta t\sigma_n = 25,000 \times 75 \times 0.05 = 9.38 \times 10^{\circ}$ Btu./hr. If variations in flow rate and in At are to be held to small values, then the only uncertainty

in Q is that due to C and eq = ,eq = 9.38 × 10° Btu./hr.

The uncertainty in heat transfer rate also affects the necessary heat transfer surface to be used. For the conditions of the problem the log mean temperature difference is:

the difference is:

$$(\Delta_4)_{\alpha} = \frac{(180 - 100) - (200 - 175)}{2.3 \log_{10} (80/25)} = 47.4 \text{ deg. F.}$$

It is assumed that variations in flow and temperature of the heating medium are negligibly small. Since $Q = UA(\Delta t)_{\infty}$, then $A = (1.69 \times 10^{\circ})/(55$ \times 47.4) = 650 ft., neglecting for the moment the uncertainties in Q and U.

Now, of a the uncertainty in A due to Q, is $(\partial A/\partial Q)\sigma_0 = [1/U(\Delta t)_m]\sigma_0 = 1/(55 \times 47.4) \times 9.38 \times 10^4 = 36.0$. (The uncertainty in A due to U is $_{c}\sigma_{A}=(\delta A/\delta U)$ $\sigma_{U}=[Q/(\Delta t)_{a}]$ $(-1/U^{a})\sigma_{U}=(1.69\times 10^{a}/47.4)\times (-1/55^{a})=59)$ ignoring the minus sign). Finally, from the expression for combining the various uncertainties, $a_0 = \pm \sqrt{36^\circ + 59^\circ} = \pm 69 \text{ ft.}^\circ$

The last step is to determine A' from the now known value of a. Its value will depend on the desired level of assurance that the exchanger will be at least adequate. If we desire a 95 percent probability, this means that the area under the curve from -∞ to A' must be 0.95. Since Table I is based on half the area, we will look up the value of $(A'-A)/\sigma_4$ which corresponds to an area of 0.95 - 0.50 = 0.45. Interpolation shows this to be 1.645, so that $A' - A = 1.645 \times 69 =$ 114 ft.", which is the area added for 95 percent assurance, and the total area A' is 114 + 650 = 764 ft. total heat transfer area.

Another typical application might be to calculate the actual number of trays No used in a bubble cap fractionator. Here the designer must divide the number of theoretical trays

NOMENCLATURE

- Specific heat. E
- Tray efficiency, actual vs. theo-
- N. Number of actual trays in fraction-
- ator. Number of theoretical trays in
- fractionator
- Heat load, Btu./hr.
- Equipment size, any units.

 Over-all heat transfer coefficient,

 Btu./(Hr. ft. deg. F.)
- Flow rate, lb./lir. Variables determining S. Ri. R:
- Temperature difference, deg. F. At
- (\Delta t)m Log mean temperature difference, deg. F.
 - Standard deviation.
- Uncertainty in S in terms of sigma resulting from uncertainties in xi,
- Uncertainty in terms of sigma resulting from uncertainty in any x_i.
- Uncertainty in S due to uncertainty in x.

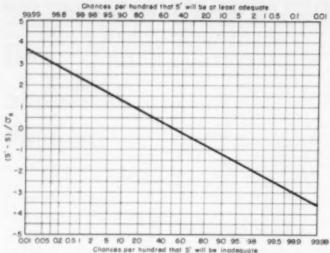


Fig. 2—Arithmetic probability paper permits representation of normal probability curve as a straight line.

 N_r by the tray efficiency E_r expressed as decimal fraction. N_r can usually be determined much more precisely than E_r . Assume this to be the case where $N_r = 50$ and $E_r = 0.75 \pm 0.08$. (The relative error in terms of sigma for E_r is frequently 10 to 20 percent.) Then $N_r = N_r/E_r = 50/0.75 = 66.7$ trays, neglecting the uncertainty in E_r .

If there were uncertainty in both N_s and E_s then the uncertainty in N_s would be:

 $\sigma_{N\alpha} = \pm \sqrt{g_0 \sigma^2 g_0 + g \sigma^2 g_0}$

However the uncertainty in N_t is negligible so that $\sigma_{N_t} = \epsilon \sigma_{N_t}$, and $\epsilon \sigma_{N_t} = (\delta N_t/\delta E)\sigma_0 = N_t(-1/E^*)\sigma_0 = 50 \times (1/0.75^*) \times 0.08 = 7.1 = \sigma_{N_t}$.

If again we wish 95 percent probability that the fractionator will have at least enough trays for the required separation, then $(N_u' - N_u)/\sigma_{vu} = 1.645 = (N_u' - 66.7)/7.1$, and $N_u' - 66.7 = 1.645 \times 7.1 = 11.7 = number of additional trays required. Therefore, <math>N_u' = 66.7 + 11.7 = 78.4$, or actually 78 total trays.

When a designer is considering several designs corresponding to different levels of probability, he may find good use for graph paper with probability scales. Arithmetic probability paper has scales so chosen that if $(S' - S)/\sigma$, is plotted along the linear scale and "chances per 100 that S' will be at least adequate" are plotted along the other or probability scale, a straight line will result, as in Fig. 2.

Two questions are likely to be asked at this point:

1. How do you get values of o, for the independent variables?

2. How do you decide which level of probability to use?

The answer to the first question is that precision measures are frequently hard to get since a great deal of engineering data have never been evaluated statistically. The designer will often have to "estimate" values of sigma and sometimes will have difficulty doing even that. But in recent years research and development people have taken an increasingly greater interest in statistical methods and more and more data are published with their precision

measures. In the future this type of calculation will probably become more usable as better information on the precision of data becomes available.

The answer to the second question is that designer must, at least at present, make the decision himself more or less arbitrarily. Some users of statistics prefer 0.9990 (only one chance in 1,000 of failure) and some prefer 0.9975 (only one chance in 400 of failure). The figure 0.9973 (which is 30) is used almost exclusively in this country in statistical quality control. The designer must remember, however, that small increments in assurance above 0.95 are purchased only with increasingly large amounts of over-design. The designer must also distinguish between design factors having a bearing on safety of operating personnel (for example, the thickness of pressure vessels) and those which relate primarily to process capacity (for example, heat exchanger heat transfer area). In the first case much higher levels of assurance must be used, possibly 0.9999 or higher.

The basic idea of estimating equipment over-design by statistical methods and some of the notations were originally suggested to the writer by Dr. F. L. Matthews of the Monsanto Chemical Co.*

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For Small Plants: 8 Tips on Solvent Safety

Most small plants can't afford a safety engineer, but a single accident may wipe out several years' profits. Yet, as G. E. Johnson of California's Division of Safety points out, accident frequency and severity rates in small plants are roughly double those in large plants. Here then are eight tips from the Safety Research Institute, Inc., on how small solvent users can keep out of trouble.

- Know your solvents: Read labels on original containers and make sure the same information goes on any small containers filled for plant use.
- 2 Use proper equipment: Equipment should prevent escape of solvent vapor into the air and unnecessary wetting of the hands with solvent.
- 3 Protect your workers: Provide all who work with solvents either personal respiratory equipment or adequate ventilating arrangements.
- 4. Control solvent use: One person in the plant should be responsible for for issuing solvent, knowing who wants it and for what purpose.

- 5 Service regularly: Solvent-using, ventilating and personal protective equipment should be serviced often and regularly.
- 6 Practice good housekeeping: Avoid solvent spills; make sure spills are wiped up promptly and soaked rags put in airtight containers.
- 7 Watch for illness: Give immediate attention to complaints of discomfort or illness, with medical examinations and room air analysis.
- 8 Ask for advice: Industrial hygiene services of states and cities can usually provide help in aetting up a solvent safety program.

Planned Maintenance Pays Off...

. . . By insuring prompt & proper attention to each maintenance job.

. . . By assuming responsibility for getting needed repair materials. . . . By recording work backlogs so crew sizes may be tailored to needs.

. . . By measuring crew performances and recommending improvements.

. . . By charting dollar performance and spotting any unfavorable trends.

JACKSON B. LEONARD

One of the newer developments in maintenance cost reduction on the modern chemical plant has been planned maintenance. Possibly 10 or 12 chemical plants now have fully developed and well organized groups of this kind. Each has adapted local customs or variations to meet its own special needs. This article will describe the general principles and objectives of a planned maintenance section and some of the results which it can give.

WORK ORDER SYSTEM

However, before a planned maintenance section can properly get under way, it is necessary to have a "work order" system established. Probably, most readers are familiar with such systems, but since this is the working basis for planned maintenance, let us review a typical system and the way it is tied into the planned maintenance section. (See the accompanying chart.)

What occurs, for example, when a production supervisor discovers that pipe replacement is needed on a water line supplying wash water to the filters in a building in his area?

He writes a work order giving a short description of the work required, fills in the cost code, building number, equipment number, etc., and forwards it to his area supervisor, or other designated authority.

The area supervisor reviews the order, checks the need for the work, and if satisfied, signs the order. In the event that he has a shutdown in mind for repairs on the filters or equipment in that area, he may note this information on the order so that the repairs to the water line can be scheduled at the same time.

The order then passes on to the production supervisor who checks these orders primarily to keep abreast of needed repairs in the plant, but also to correlate production demands

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and equipment outage so that needed repairs can be made.

In the maintenance department, the maintenance area supervisor for the area involved scrutinizes each order, and assigns it to one of his foremen for completion. He initials the order, writes in the name of the foreman to whom the work order is assigned, and passes the order on to the maintenance clerk.

Here the code, equipment and building number, and signatures are checked, and the copies distributed as shown on the chart.

PLANNED MAINTENANCE SYSTEM

The two copies of the work order which are turned over to the planned maintenance section are handled as shown. We see that the maintenance clerk first records the work order number, description, and date received in a master schedule book and immediately forwards the order to the mechanical foreman to whom the order was assigned.

The foreman inspects the job in the plant, and makes his analysis of the order listing number of men and time required, lists all major materi-

ORIGINATOR Writes or

FLOW

ORDER

FLOW

Writes order giving as much information as possible on work desired.

AREA SUPERVISOR

Approves order; may mark tentative date when equipment will be available.

PRODUCTION SUPERVISOR

Approves order; may confirm date when equipment will be available.

MAINTENANCE AREA SUPERVISOR

Approves order. Assigns to specific foreman for completion.

MAINTENANCE CLERK

Stamps number. Checks code, equipment number, etc. Distributes copies: to area production supervisor; to maintenance clerk's files for costs; to planned maintenance.

MAINTENANCE CLERK

Records number, description, and date in master schedule book.

MECHANICAL FOREMAN

Analyzes order. Estimates number of men and time required. Lists all materials required. Notes if equipment shutdown is required, and duration. Contacts area production supervision if further information is needed.

MAINTENANCE CLERK

Records date and analysis in master schedule book. Enters estimated man hours in crew backlog record.

MATERIALS CLERK

Orders any materials not carried in stores. Maintains record of this material. Expedites purchase orders as necessary.

SCHEDULING FILES

Files one copy for each mechanical foreman. Files orders under "Pending Material" or "Pending Scheduling."

MAINTENANCE ENGINEER

Prepares weekly schedules for each crew in cooperation with the area maintenance and operating supervision.

Orders are the working basis for planned maintenance. Above is the diagram for keeping things shipshape in a typical plant. Note where the two flows tie together.

	1					
Work of 10/19-10/26	Crew 1	Crew 2	Crew 3	Craw 4	Crew 5	Crew 6
Total Man Hours Worked	480	400	440	460	480	400
On Schoduled Work	448	353	290	280	440	190
Schadulad	455	360	340	400	400	200
On Routine Work	25	40	140	80	*40	200
Schedulad	25	40	100	60	*80	10
On Emergency Work	7	7	10	*120	0	10
Available Man Hours Kopt on Schodule	98%	98%	85%	*70%	3/0%	95%

Note: Crew 4 performance low due to emergency breakdown of "32-4" grinding mill. I sevestigation under way.

(rew 5 routine requirements have been reduced due to alimination of the rebuilding filter plates & frames because corrosion resistant material was substituted. Routine hours will be adjusted & 1 man transferred to another crew.

Week of	This Week	Lost Week	1 Month Ago	6 Months Ago
Crew 1	1680	1800	1750	1980
Crow 2	*2440	2300	2000	1400
Crew 3	*/200	1400	1500	18000
Crow 4	2000	1850	1900	1800
Crew S	2600	2500	2700	2300
Crew 6	1900	1800	1750	1800

Notes: It is recommended that 2 men be transferred. From Crew 2 (note rising backlog) to Crew 3 (note diminishing backlog.)

Measurement and control of crew performance are part of the maintenance job.

als needed, contacts area production supervision if further information is needed, and notes the total equipment outage time needed to do the job.

The analyzed order is then returned to the maintenance clerk who records this information in the master schedule book, enters the estimated man hours in the backlog record of the crew involved, and then passes the order on to the materials clerk.

The materials clerk orders any material which is not carried in stores, checking with the mechanical foreman if additional information is needed. He maintains a record of this material and expedites orders as necessary to obtain adequate delivery. As soon as the requisitions for needed material are written, the analyzed work

order is placed on the scheduling files, of which there is one for each mechanical foreman. Each file is divided into two parts: (1) pending material, and (2) pending scheduling.

The ground work is now laid so that the planned maintenance engineer working with the area production supervisors, and the area maintenance supervisors, prepares a weekly schedule for each area crew. Thus, the necessary equipment shutdowns can be arranged in advance for the area, or the entire plant if need be, the material needed to do the work will be obtained and made available, and only the amount of work that each crew can handle will be laid out.

This weekly schedule is issued at the beginning of each week. Each

production area supervisor receives a copy to enable him to check and follow on the repair work in his area. Each area maintenance supervisor receives a copy which permits him to follow and check on the work of each of the foremen under his supervision. Each mechanical foreman receives a copy of his schedule with the original copy of the work order attached so that all his analysis information is available. As he completes the work on each work order, the mechanical foreman turns the order back into planned maintenance so that it can be 'closed out." By this we mean that the man hours are deducted from his backlog, and the total costs of the job are accumulated and recorded on the face of the work order before it is filed under equipment cost files. Orders which are not completed are turned back into the planned maintenance section for rescheduling the following week. Completion of the work on this schedule is entirely in the hands of the maintenance supervisors and their foremen.

Thus, we see that planned maintenance simply lays out or plans a normal week's work for each crew; it does not attempt to specify what day each job is to be done, except those which require equipment shutdowns. All other jobs can best be handled by each individual foreman who takes the weekly schedule from planned maintenance, and lays out a schedule of work for each day. This planning of each day's work for each crew is a tremendous step forward in bringing up the effectiveness of the entire maintenance department.

You might think that once planned maintenance has gone through all these steps of preparing and issuing the weekly schedule, and ordering and obtaining the material needed to do the jobs, that its task would be done. However, this is far from being the case. It now enters into its secondary function which is the measure and control of the individual crew performance.

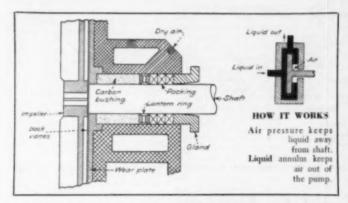
Let us look first at the control function. The first concern of planned maintenance is to see that its weekly schedule is completed. Therefore. each day, the maintenance clerk uses the completed work orders turned in by each foreman to record the work performed by each crew. At the end of each week, a performance report is issued to all members of mechanical supervision. (See Summary Chart.) When the performance of any crew is poor, an investigation is made and corrective steps are taken. This control can be used effectively to strengthen weak supervision, or concentrate maintenance studies to determine aids for any crew or area which runs consistently low in performance.

A second control is the weekly backlog report. (See Chart.) This helps determine crew performance and size.

Another good control point is emergency work orders. Obviously,

emergency breakdowns cannot be planned or scheduled. Therefore emergency work constitutes a serious interruption to scheduled work, so that the best thing to do is eliminate or reduce emergency work. The planned maintenance engineer should investigate all emergency orders and recommend ways of correcting the conditions leading up to these emergencies. If the problem is too complicated for immediate solution, he may recommend the problem to the maintenance engineer for study.

Measuring the performance which (Continued on p. 139)



A Leak-Proof Stuffing Box

It's good for pumping liquids that: dissolve packings or grease; are flammable; must remain anhydrous; have an obnoxious odor.

C. A. BUTLER, Jr., and H. C. SUTTER

Occasionally we are faced with the problem of pumping a liquid of a nature such that no drippage at all from packing can be tolerated. Usually such situations can be taken care of by ordinary methods of supplying a sealing liquid through a lantern gland, by sealing with grease, or by one of the various forms of mechanical seals which are available. But sometimes the liquid being pumped is of a nature that precludes the standard remedies.

For instance, in one case a liquid was to be handled which was so obnoxious that an operator couldn't stay in the pump house with even a slight drip from the packing. The liquid was a solvent which made grease scaling impossible. The gland could not be scaled with water since the system had to be kept absolutely anhydrous, and there was no scaling liquid available which could be introduced through

a gland because it was impossible to allow contamination of the fluid being pumped.

The solvent action on any packing or mechanical seal made it necessary to keep the liquid being pumped out of contact with a shaft seal under normal operation.

In solving this problem, a simple scheme was applied which probably has many applications to difficult pump scaling problems.

The theory applied in the solution of this problem involves the use of a sealing fluid which has a radically different specific gravity from the fluid being pumped. This might be a light liquid used in conjunction with the pumping of a heavy liquid, if it should be objectionable to use gas as the sealing medium as was done in the case described.

In applying this theory to the solution to this problem, the principle of a liquid sealed centrifugal shaft packing such as is often used on steam turbine shafts was combined with the well known action of backvanes on a pump impeller. Dry air from an external source was used to keep the liquid being pumped from coming in contact with the stuffing box. The liquid being pumped was used as the fluid in the centrifugal portion of the scal. By this means an annulus of liquid is formed in the space between the back of the impeller and pump casing. The gas pressure introduced into the lantern gland will tend to force the liquid toward the periphery of the impeller. The minimum air pressure required to prevent leakage will be that pressure that normally exists on the stuffing box, and the maximum pressure will be sufficiently higher than the minimum to make it practical to control the pressure of the sealing gas. Since none of the sealing gas is continuously introduced into the pump itself, the pump will not gas-bind, and the only consumption of the sealing gas is that which leaks through the packing. Since the packing proper seals only against gas pressure (in this particular case, dry air) any good type of self-lubricating packing can be used. As long as the solvent is not allowed to come in contact with the packing, the impregnation in the packing will not be removed.

The accompanying diagram is an actual installation which has been operating for a number of months. Operating conditions are:

In this particular installation, the dry air is controlled manually by the operator and requires practically no attention. An inexpensive pressure controller would probably save air. Special care must be taken to maintain close clearance between the backwares of the impeller and the wearing plate. Under normal operating air pressures, there is no evidence of air leakage into the pump and absolutely no leakage of liquid through the seal.

Where the liquid pumped is highly flammable, the sealing gas could well be an inert gas such as carbon dioxide or nitrogen. With the shaft packing in good shape, the gas consumption is so low that it would not be prohibitively expensive to supply such gas from a cylinder.

C. A. BUTLER, JR., is director of engineering and R. C. SUTTER is design engineer in the Central Engineering Department of the Diamond Alkali Co., Cleveland.



Trend in all Soviet industry is toward the East. Majority of newer plants lie within the Berezniki-Tashkent-Cheremkovo triangle.

Can You Afford to Ignore Russia's Chemical Industry?

The Kremlin's cold war, and the possible hot one, is being backed up by the chemical process industries. Witness—"Chemical Five-Year Plan" (1938-1942); Russian Oak Ridge at Ukhta.

MARSHALL SITTIG

The Russians are definitely in the headlines these days. Their political and diplomatic tactics are on the tips of everyone's tongue. Still, the Russian Bear remains as much of a mystery to the outside world as it was in the days of the Czars.

LET'S SUPPOSE

Let us suppose that you work for Dow at Midland, Mich., extracting halides from brine. Have you ever heard of Solikamsk in the northern Ural Mountains? There, your Russian counterpart tries to keep his costs down and his yields up, too.

Let us supose that you work for Socony-Vacuum Oil Co. at Paulsboro, enriched air is justified for your operations.

Let us suppose that you work on the atomic piles at Hanford, Washington, making plutonium for atomic bombs. Unfortunately, you too have a Soviet counterpart in the mountains above the city of Irkutsk, overlooking

N. J. There's an operator over in

Grozny, in the oil fields of the Cau-

casus, considering the same problems

of firing rates to tube stills, pressure

drops across fractionating columns,

engineer in Stalinsk in Siberia is pre-

occupied with the same problems re-

garding pressure operation of blast fur-

naces and whether or not oxygen-

Let us suppose that you work for U.S. Steel at Pittsburgh. Another

and the like.

All of these examples are cited to show that you and I, as American engineers, should be interested in-and have some ideas of the potentialities

the swift Angara river as it flows into

Lake Baikal, deep in Siberian Russia.

of—the chemical industry in the Soviet Union. The aim of this article is most definitely not to promote any fellow-traveller spirit among American engineers. Its aim is to promote a realistic evaluation of the chemical industry of the major power opposing U. S. aims in the world today. In the event that a peaceful solution of present differences is reached, trade between the two countries should attain high levels. In the alternate event that the cold war comes to a boil, strategic bombing will be directed at these (and our) centers of chemical industry.

The third Five-Year Plan (1938-1942) was widely known as the "Chemical Five-Year Plan." Actual figures on the current (1946-1950) Plan are not available but the figures (see cut) are indicative of the general scale of things. Projected Soviet annual outputs in 1950 are compared with approximate current U. S. production figures.

Marshall Styric is a chemical engineer who has followed industrial developments for many years. His files, augmented by material from the Russian journals which he handles for Chemical Abstracts, were the source of this article.

A GRAIN OF SOVIET SALT

These Soviet figures must be taken with a grain of salt since Soviet statisticians may include defective output in total production and may also include production from Soviet satel-lites. Soviet figures on production are often given merely as percentage increases over some previous year. This use of percentage gives humorous but misleading results as in the example of the annual statistics from an Arctic station where it was reported that 2 percent of the men had married 50 percent of the women, although only one marriage was involved.

Let us consider the Russian chemical industry in more detail. The map illustrates the over-all picture. The major industrial concentrations become apparent. The Donbas (Don River Basin) and the Moscow area were the centers of much of the chemical industry prior to World

War II.

The major industrial areas now lie in the Ural Mountains, in Soviet Central Asia-near Tashkent, in the Kuzbas (Kuznetsk Basin), and above Lake Baikal-near Cheremkovo. Some industry exists in the extreme Far East, but the majority of the newer plants lie within the Berezniki-Tashkent-

Cheremkovo triangle.

Russian industry is somewhat unique in its choice of energy sources. Russia has received a good bit of publicity for its work on the underground gasification of coal, but it is not so widely known that Mendeleev, of periodic table fame, first proposed this technique-and this claim was established before the present Russian rash of "firsts" in the invention of practically everything. The present status of underground gasification is not clear however since the magazine Ugol (Coal) deals almost entirely with improved mechanical methods of shaft mining and virtually ignores the technique of underground gasification.

Gorlovka, in the Donbas, is stated to be the site of one underground gasification plant. The first commercial installations of this process were made about 1936 in the Soviet Union. Operation of underground gasification plants is so controlled that high calorific value gas may be obtained for boiler plants or feed gas may be produced for the manufacture of synthetic gasoline, ammonia. or methanol.

Russia is rich in petroleum resources but lacks refining and distribution equipment when compared to the United States. In this respect, Russia is looking northward and, they have built a refinery at Ust Ukhta (literally-the mouth of the Ukhta River) near the shores of the Arctic Ocean. The original Russian petroleum center was at Baku on the

Caspian Sea.

In 1901 Baku supplied half the world output of petroleum and still accounts for about 70 percent of Soviet production. Heavy tanker traffic from Baku up the Caspian and up the Volga still makes Baku the first seaport of the entire U.S.S.R. A "second Baku" is now located above the north end of the Caspian. at the southern end of the Urals. Ufa, Saratov, and Orsk are three centers of this new area. Refining capacity in the Far East is probably very limited, but a refinery is known to have been built at Komsomolsk, processing Sakhalin crude.

The extent to which peat is exploited in the U.S.S.R. is relatively little known in the outside world. A separate journal, Torfyanaya Promyshlennost, (Peat Industry) is devoted to methods of peat harvesting and utilization. The peasants, of course, harvest it for home fuel but few outsiders realize that there are large peat-fired central power stations in Moscow and Leningrad.

Shale is destructively distilled to produce shale oil in Estonia. Shale is also being gasified and a 150-mi. pipeline feeds Leningrad industries

from this source.

Natural gas has been exploited in European Russia as a major industrial fuel. A pipeline has been laid from Saratov on the Volga to Moscow, a distance of 500 mi. A second pipeline connects gas wells in the Carpathian Mountains with Kiev, the capital and industrial center of the Ukraine. The U.S.S.R. has the world's largest reserves of natural gas-estimated at 985 billion cubic meters. Reserves of natural gas are found in many regions, not only in the oil regions of European Russia, but in

Central Asia and in the Komi Autonomous Republic at the northern end of the Urals. This latter location affords a nearby source of supply for the chemical industry in the Solikamsk-Berezniki region.

Synthetic fuels from coal were not roduced in Russia prior to World War II but captured German synthetic fuel plants were dismantled and recrected in Soviet territory. Cheremkovo in Siberia is reported to be the

site of an oil-from-coal plant. Gas-burning automobiles using wood and peat as fuels are described in a recent Russian book on automobile design and construction; this indicates continued interest in substitute fuels.

Russian coal reserves are very large and were estimated at 1654 billion tons in 1937. The Stakhanovist movement (named after a coal miner, Alexei Stakhnov for increasing individual output) continues to be widely propagandized and new goals for individual output are constantly set up under this program. The old Russian coal center was in the Donbas. Newer centers are in the Kuzbas in Siberia, and at Karaganda in Central Asia. Another newly developed field lies in the Pechora River Basin near the Arctic Circle and just west of the Urals. A railroad connects the town of Vorkuta in this area with Leningrad.

Hydroelectric power in the U.S.S.R. as elsewhere serves as a nucleus for chemical industry. The famous Dneiper Dam, destroyed by the Germans and since rebuilt, is of course well known. Other huge plants are under construction or completed at Kuibyshev on the Volga, on the Angara River above Irkutsk, in the vicinity of Leningrad, at Ust-Kamenogorsk in Siberia, and at Farkhad in Central Asia.

Some of the first nitric acid plants were started in 1923-28 by American engineers under the Gosplan (the "State Plan" which preceded the first (Continued on page 124)

920 million cu m 900,000 tons Synthetic fuel from one 195 55 million tons 250 600 million tens USA 25.4 85 million fons 82 280 billion kwh 0.8 400 million tone 0.39 2.5 million tons 400 million tons 160 billion ou m

The Plant Notebook

THEODORE R. OLIVE, Sonior Associate Editor

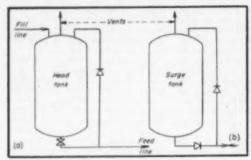


Fig. 1-Check valves improve head and surge tanks.

How to Get the Most Use From Your Check Valves

DAVID E. MORRIS, Research Laboratories, Mallinekrodt Chemical Works, St. Louis 7, Mo.

*July Contest Prize Winner

The check valve is frequently condemned, sometimes praised, much relied on and rarely serviced. Actually, within the single limitation that bottle-tight closure seldom occurs, the check valve can and does contribute to safety as well as economy in process units. It is the cheapest and potentially the most useful automatic control instrument. Where properly applied it contributes much toward elegant simplicity in process piping. Improperly applied it can be extremely dangerous through affording a false sense of security. This is particularly so in the all too frequent use of a vertical check valve installed for normally downward flow; it then ceases to be a check valve and becomes an excess flow valve closing only against large upward flow.

The conventional use for check valves at pump discharges, at interconnection points of systems such as steam and water, and so on, are well known. Less well known but none the less practical is the use of the horizontal swing check as a safety valve on a vacuum still or as a vacuum breaker on a process vessel that will not with-

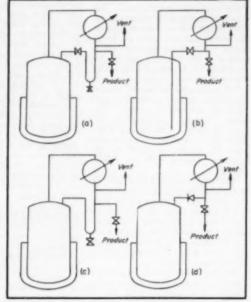


Fig. 2-Development of an improved reaction-still setup.

stand vacuum. The pressure difference required to operate the valve is quite small. The cost is low and maintenance (if any) is simple, requiring no special parts inventory. A related application is the use of the check valve fitted to a tee on a steam sparge line: when the steam is shut off, the check valve will admit a little air and avoid drawing corrosive process liquors into the steam connection. In both of these applications the control action occurs on a slight pressure change from atmospheric; the precise magnitude of this change is not critical provided that it be quite small.

★ AUGUST PRIZE WINNER-A \$50 prize will be issued to . . .

F. J. GRADISHAR

Jackson laboratory, E. I. du Pont de Nemours & Co., Wilmington, Del.

... for an article describing a simple visual flowmeter, adaptable to any capacity rating, accuracy or flow range, for corrosive gases that cannot be handled with glass rotancters. This article has been judged winner of our August contest and will appear in the October issue.

\$50 PRIZE FOR A GOOD IDEA-Until further notice the editors of Chemical

Engineering will award \$50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the September winner will be announced in October and his article published in November. Judges will be the Editors of Chemical Engineering. Non-winning articles submitted for this contest will be published if acceptable at space rates.

HOW TO ENTER CONTEST-Any reader of Chemical Engineering, other

than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address Plant Notebook Editor, Chemical Engineering, 330 West 42nd St., New York 18, N. Y.

When a head tank is used as a supply source for a process chemical or solvent, it is frequently at some distance from the using station. The feed line, being completely filled, can be ruptured by moderate temperature rise. As shown in Fig. Ia, this difficulty is readily eliminated by relieving expansion through a check valve. At the same time it will prevent metering error due to air drawn into the feed line. A similar situation occurs in the design of piping to and from a surge tank intended to accumulate recovered solvent for re-use. The arrangement depicted in Fig. 1b requires but one line to the control center. This scheme is especially useful where piping is congested or where the batch tank is located above the operating level.

The process engineer has frequent occasion to arrange a batch set-up permitting a reaction mixture to be heated under reflux for a time, and then distilled. This is most eften done as shown in Fig. 2a and occasionally as shown in 2b. The latter is the more compact but may be difficult to keep operative. The first approach to simplifica-tion was as shown in Fig. 2c. It is essential that the product connection be carefully placed to permit total take-off if required. This scheme requires but one valve to be manipulated and avoids condenser flooding, since closing the single take-off valve merely results in total reflux. It is apparent at once that the reflux trap is but a check valve and may be so replaced as shown in Fig. 2d. with a saving in space and liquid hold-up which can be important. This method of replacing a U-trap is not limited to simple stills but is equally satisfactory for column installations. The scheme shown in the last figure can and has been used to return column reflux to a still pot. If the still is to be used for alcohol there is then the advantage that one padlocked valve is omitted.

Vacuum Dispenser for Labels

ROBERT L. MILLER, Northern Ohio Engineering Co. Barberton, Ohio

+5

support

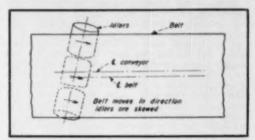
In picking up labels or small direction slips that are to be inclosed in packages there is always a problem in having a convenient way of storing these papers, and at the same time, of providing an easy way of obtaining one slip at a time without disturbing the pile. Usual difficulties lie in trying to separate one slip from the pile by hand, in disturbing the pile, in taking a handful and losing half of them, and in generally messy operation.

Although there are good friction feeders available, these generally are good for only one size

and often prove troublesome when used under the adverse conditions encountered in many chemical plant packaging operations.

The simple device pictured here consists of an inner tube of light-weight metal such as aluminum, selected to be an easy sliding at within a steel outer tube of reasonably accurate bore. The fit must allow free movement, but no considerable loss of vacuum. The papers are secured in a holder of any suitable type so that when the movable tube is lowered, the vacuum will pick up the top label. The vacuum can be supplied by an aspirator, but a small rotary vacuum pump of \(\frac{1}{2}\)-to\(\frac{1}{2}\)-in. suction-pipe

size is preferable. Such a pump can be powered successfully with a t-hp. motor and makes an excellent portable unit.



Pointers on the Training Of Belt Conveyors

CHESMAN A. LEE, Engineer, Evanston, Ill.

It is an unfortunate fact that not all those who install belt conveyors know how to train them properly. That being the case, it is not surprising that not all those who use them understand the problem, and how to increase the life of the belt. These conclusions are inevitable from the many cases this writer has seen where it had seemed necessary to install side-guide idlers, or tighten up hard on the takeup screws.

Side-guide idlers are not objectionable as long as they are not required! They should never be installed until after the rotating parts have been set square in line, and the belt is running straight down the middle. Then they can be installed to act as policemen. The point is, of course, that the belt should be guided by its flat surfacenot by its edges.

A belt idler is like the front wheels of an automobile. The car goes in the direction that the wheels are skewed; and so does the belt. In other words, if the belt is running to one side, it is because at least one pulley is skewed in that direction. The sketch shows what happens. To bring the belt back in line, find the source of the trouble rather than to apply side-guides.

It is comparatively easy to train a belt, although time consuming. All pulleys should be checked for obvious misalignment and corrections made where indicated. These adjustments are made with the belt running. All idler brackets have slotted holes for this purpose. Loosen the bolts just enough so that the bracket can be shifted by striking the end of the base. After the obvious adjustments have been made, a whole series of small adjustments will be required to finish the job. As training of the belt proceeds, it will become less and less easy to pick out idlers needing further adjustment. Keep on adjusting the idlers until the belt runs true. Then make sure all bolts are drawn up tight.

It is assumed that the belt ends have been properly squared in the first place. This is important. However, once a belt has been properly installed and trained, it will run true. It will receive its load properly and carry it without spilling. Equally important, it will last a long

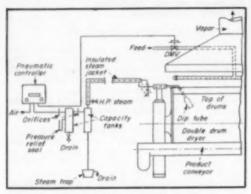
In going about a training job, procedure may be organized as follows:

 Check the tail pulley to see if the takeups are evenly adjusted. If the pulley is not skewed and the belt runs off to one side, it means that the return idlers are not leading the belt properly on to the pulley. Make a series of adjustments as required on the return idlers until the belt runs fair to the pulley. Final small adjustments can be made with the takeups, provided the pulley still seems square afterwards.

3. Adjust the troughing carriers, starting with the section that is worst off. With each adjustment the belt will move over a little, but it will move most when the

most out-of-line idler is corrected.

4. Go up and down the line making slight adjustments until the belt runs true. Incidentally, if a belt is really trained correctly, it will be reversible and still run true. Conversely, if a belt is to be reversible, it must be properly trained or it will be worn out long before its time through edge wear. Again, the occasional use of self-aligning idlers is justified, but the belt should be trained and retrained until these idlers float square with the belt. Also it is important that they should always swivel easily on their turntable.



Automatic Level Control for Double Brum Bryers

HOWARD H. Fox, Mechanical Engineer, Buffalo Process Equipment Corp., Buffalo 10, N. Y.

Double drum dryers are successfully achieving efficient drying of materials of various densities and viscosities, and with a minimum of supervision. Nevertheless, continuous level control is required over the liquid between the dryer drums if a product of uniform moisture content is to be made at maximum rates. Often automatic control can satisfactorily be applied to the level variable. Where it is applicable such equipment is a profitable investment.

A system of level control employing a modified bubbler system is illustrated here. Steam from a high pressure source is passed through an insulated steam jacket and is metered at a rate of 5-10 lb. per hr. through an orifice to an immersed "dip tube" having an expanded outlet. The pressure developed by the steam bubbling through the boiling liquid between the dryer drums is sensed by a pneumatic controller which modulates the air supply to a diaphragm motor valve controlling the dryer feed. Pressure pulsations induced by the boiling are damped by series capacity tanks and orifices which are sized experimentally.

A portion of the high pressure steam after being metered condenses and dilutes materials adhering in the expanded section of the dip tube. This condensation obviates clogging during long periods of dryer operation. Formation of condensate within the pressure tube between

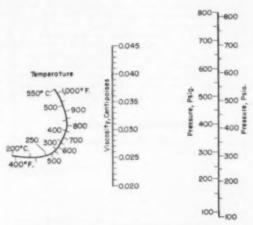
the dip tube and the capacity tank is prevented by the elevated temperature of the jacket steam. Any condensate forming in the unjacketed capacity tank is discharged through a steam trap, while further condensation within the system is prevented by entrapped air which serves as an efficient insulator.

Should the dip tube become clogged after long operation or for some other reason, the pressure sensing element is protected by means of a U-tube seal opening to the atmosphere and connected in series with the damping orifice so at to limit the relief quantity. Action of the diaphragm valve is such that it automatically closes with air failure, a rise in the liquid level or the clogging of the dip tube. In such a case the dryer will merely operate dry until conditions are corrected.

Before specification of the control element of the system it is advisable to determine the effective hydrostatic head experimentally by use of a manometer and aspirator bulb connected at point A in the diagram. Hydrostatic pressures developed by boiling liquid-steam mixtures are usually unpredictable.

The control system described has an inherent and recognized limitation. By its very nature the feed must

be of uniform quality.



Nomograph Gives Steam Viscosity at High Temperatures and Pressures

C. J. Major, Sharples Chemicals, Inc., Wyandotte, Mich.

Viscosity data of Hawkins et a for steam at high temperatures and pressures are presented in tabular form by Perry*. This viscosity table is not very convenient to use at intermediate values of temperatures and pressure as considerable interpolation is necessary. The accompanying nomograph gives a convenient estimation of the viscosity of steam. The values obtained from the nomograph do not deviate from the data of Hawkins by more than about 2 percent.

The use of the chart is illustrated as follows: What is the viscosity of steam at 750 deg. F. and 550 psig? Connect 750 on the Fahrenheit temperature scale with 550 on the gage pressure scale and read 0.0324 centipoises on the central scale.

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Salad Oil From Rice Bran

Continuous solvent extraction of bran provides domestic source of rice oil plus improved cattle feed.

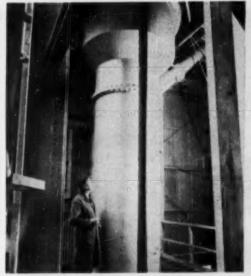
JAMES A. LEE

Oil from rice bran, once a nuisance factor, has emerged in the past year as an edible oil of commercial importance. Rice oil is very stable, does not become rancid, has an iodine value of 1.08 and is comparable to peanut oil. It is sold primarily for salad dressings and cooking. The bran from which the oil has been extracted may be

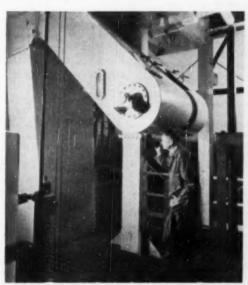
The bran from which the oil has been extracted may be packaged and sold as a cattle feed with less danger of its turning rancid in storage. The palatability and digestibility of the bran is improved and in addition, the protein content is increased.

This Houston plant of the American Rice Growers Cooperative Association is the only plant for the continuous solvent extraction of oil from rice bran in the United States. It was designed by Allis-Chalmers Manufacturing Co., and began operations just a year ago. Capacity is 50 tons of bran per day, production is 15,000 lb. of crude oil. The process uses operations which are similar to other oil extraction processes, but it differs in equipment detail.

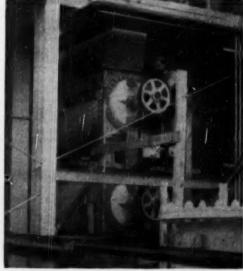
JAMES A. LEE, our Southwest editor reports here on a Houston plant.



1 EXTRACTOR COLUMN—Bran which has been removed from rice grains enters the extractor from a conveyor at the top. Hexane which is used as a solvent enters at the bottom, flows countercurrent to the bran and leaves from the top as miscella, the mixture of oil and solvent. Spent bran is carried from the bottom of the extractor to a drain classifier.

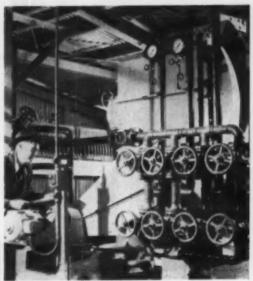


2 CLASSIFIER—Here the miscella remaining in the extracted bran drains out and returns to the bottom of the extractor. Spent bran is transferred from the drain classifier to the dryers directly below where the last traces of solvent are removed by the use of heat from a steam jacket.

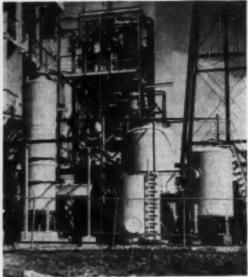


3 DRYERS—The three steam-jacketed dryers are equipped with internal ribbon conveyors for moving the bran. Free of all solvent and odors, spent bran is returned by screw conveyors to the rice mill for packaging. Solvent vapors are directed from the dryers to a vapor scrubber drum.

(Continued next page)



4 FILTERS—The bulk of the miscella from the extractor flows to a surge tank from which it is pumped to a filter press. This leaf-type pressure filter removes traces of fine particles of bran that are sometimes suspended in the mixture of solvent and oil. Clear filtrate proceeds to another surge tank and then to a steam heated exaporator.



5 SOLVENT RECOVERY—Heated to 180 deg. F. in the evaporator, the miscella enters a flash chamber where 95 percent of the solvent flashes off for recovery in a condenser. Oil and remaining solvent are separated in a bubble cap vacuum tower. Recovered solvent returns to the process. The crude oil is cooled and stored.

RUSSIA'S CHEMICAL INDUSTRY (Continued from p. 119)

Five-Year Plan). A synthetic ammonia plant at Grozny was among these. Other Russian synthetic ammonia installations are known to be at Berezniki and at Stalinogorsk. These plants were initiated by American engineers in the period 1933-35 and use semi-water gas from coke as a source of hydrogen. A recent statement to the effect that a hydroelectric plant on the Chirchik River near Tashkent would power huge nitrogen fixation facilities leads one to believe that the are process may still be in use in the U.S.S.R.

Russian interest in plant sources of rubber has always been high. Tau Sagiz (Mountain Gum) is one such plant, growing in the form of bushes 3-4 ft. high in the southern province of Kazakhstan. It matures in 2 to 3 years, dies after 4 years and has a rubber content of about 30 percent. Krim Sagiz (Crimean Gum) is a grass of the dandelion family and contains 5 percent rubber. It yields a crop every other year. Kok Sagiz is another source—a grass with rubbery roots. Current

technical journals describe the compounding of these materials, so they apparently play a significant part in the over-all rubber supply picture.

Sovprene is the Russian term for a chloroprene polymer similar to our Du Pont neoprene. Erivan in the Armenian Republic is the site of the original Sovprene plant. Plants have subsequently been built in the Urals and in Siberia it is believed.

Rubber from butadiene, by the Lubedev process, is made at Yaroslavl and Kazan using potatoes as a source of ethyl alcohol, and at Baku from petroleum butadiene.

Uranium exists at Joachimstal in Czechoslovakia and probably at many places in the U.S.S.R. We know now that it has been fashioned into an atomic explosive in Russian hands.

A research establishment, similar to the Oak Ridge Laboratories, has been set up at Ukhta in the Far North. Radioactive mineral deposits exist in this neighborhood. It is interesting to note that radioactive hot springs have been reported in the eastern Soviet arctic.

An underground production plant for the manufacture of fissionable materials is located in the Sanga Valley in Armenia (near Erivan on the map) according to recent reports. This nonstrategic location was presumably picked because of delays in the construction of Siberian hydroelectric projects.

Other places named as centers of atomic work include Alma Ata (the Russian "Hollywood") in south central Asia, Sukhumi in Georgia, Kara Kul in Kazakhstan, Zlatoust in the Urals, and Tashkent in Uzbekistan.

A potential, if not existent, center for the manufacture of fissionable material is above Lake Baikal on the Angara River. A huge hydroelectric project has been under construction there for some time and its remote location is ideal from a security standpoint. One source locates the Soviet "Oak Ridge" between Usole and Cheremkovo, in the Irkutsk region.

The Kara Tau Mountains in Central Asia make up one of the largest phosphate deposits in the world. Sulphur from sulphur mines, as well as sulphur recovered from copper smelter gases, is converted to sulphuric acid in this same area for fertilizer manufacture.

At Kirovsky on the Kola Peninsula are found tremendous deposits of calcium phosphate in the form of apatite.

The long-term objective of the Soviet steel industry is an annual out-

put of 60,000,000 tons by 1960. The prewar center of steel industry was in the southern Ukraine where coking coal, rich iron ore, and hydroelectric

power are all available.

The trend in the steel industry, as in all Soviet industry, is toward the East. Thus, mills in the Urah have been the first step in this direction. Magnitogorsk (Magnetic Mountain) is well known and is said to rank next to Gary, Ind., as the world's second steel center. New mills have been built at Stalinsk in Siberia, at Tashkent in Central Asia, and at Kom-

somolsk in the Far East nearer Korea.

Kandalaksha, on the far northern Kola Peninsula, to the east of Finland, is one of the centers of the aluminum industry. A future aluminum center is rising in Siberia on the Irtish River in the neighborhood of Ust-Kamenogorsk.

The Soviet Union has an exportable surplus of manganese and chromite. There are large copper and zinc reserves which are being exploited to

an increasing degree.

The famous Dnieper Dam was the original nucleus for electrochemical

development. Hydroelectric installations on the Kola Peninsula and in the Caucasus have followed and future sites are in the Urals and in the Tien Shan range in northern Mongolia.

In addition to the extraction of halides from brine at Solikamsk in the Urals, as mentioned at the beginning of this article, another large industry of this type is located in the southwestern part of the country on the Kara-Bogaz Gulf. Here, on the eastern shore of the Caspian Sea, sodium sulphate and other chemicals are extracted from Caspian Sea water.

Evacuation Time With Reciprocating Pumps

ERNEST F. JOHNSON, Jr.

In a recent article Hicks (Chem. Eng., June 1950, pp 108-110) has shown how to calculate the pumpdown or evacuation time for systems with reciprocating vacuum pumps. His method of calculation is an approximate tabular one designed to eliminate the use of calculus.

It is suggested here that a rigorous calculation in many cases is simpler to use than the tabular method, and its results will be certain within the limitations of the initial assumptions. Tabular methods involving summations of quantities based on averages of successive increments frequently require some skill and experience in selecting the proper increments for reasonable accuracy. The use of a rigorous calculation requires no such skill or experience.

Consider a system consisting of a receiver of volume V, under an absolute pressure of P, and a reciprocating vacuum pump of displacement D, discharging to atmosphere. Ordinarily the pump volumetric efficiency E. may be assumed to be a linear function of the absolute intake pressure, with the P-axis intercept equal to the dead-end rating of the pump. Volumetric efficiency as used here is the ratio of free air delivery to pump displacement, and hence it includes the effect on gas volume of the pressure drop across the pump as well as the slip between the piston and cylinder wall.

If m is the slope of the line relat-

ing E, and P, and b is the E, axis intercept, then

$$E_v = mP + b \tag{1}$$

If the pressure drop between the receiver and the pump is small, P is also the pressure in the receiver.

It is desired to determine the time required to reduce the receiver pressure from P₁ to a final pressure P₀. Let V equal the volume of free air pumped out at atmospheric pressure P₀ in time 0. Then, by definition,

$$dV/d\theta = R.D$$
 (2)

Assuming the simple gas laws apply, at constant temperature

$$P(V_r + VP_a/P) = P_1V_r$$
 (3)

where P is the pressure in the receiver at time 0. Rearranging and differentiating.

$$dV = -(V_c/P_a)dP (4$$

Combining Eqs. (1), (2) and (4) and collecting terms,

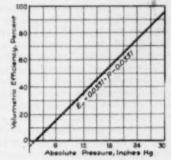
$$dP/(mP + b) = -(P_aD/V_c)d\theta \qquad (8)$$

Integration of this expression between P_1 and P_0 and 0 and θ gives the equation for pump-down time:

$$\theta = \frac{V_r}{mP_aD} \ln \left(\frac{mP_1 + b}{mP_2 + b} \right) \qquad (6)$$

As an example of its use, Equation (6) may be applied to the example given by Hicks (loc. cit.). In this problem V. = 200 cuft., P_e = P₁ = 29.8 in. Hg, D = 60 cfm., P₂ = 2.5 in. Hg, and from the plot of E_e, vs. P₁ m = 0.0331 and b = -0.0331.

vs. P_r m = 0.0521 and 0 = Substituting in Equation (6), θ = $\frac{[200/(0.0331 \times 29.8 \times 60)] \ln [(0.0331 \times 29.8 - 0.0331)/(0.0331)]$



Straight-line volumetric efficiency curve anumed for use in Equation (6).

× 2.5 — 0.0331)] = 3.38 ln 19.2 = 10.0 min. The pump-down time computed by the approximate tabular method was 9.0 min., which is 10 percent lower than the result found here.

NOMENCLATURE

≈ E_v-axis intercept of line relating
E_v and P.
= Slope of line relating E_v and P.

 E_{ν} = Slope of line relating E_{ν} and P_{ν} .

percent.

D = Pump displacement, cfm.

P,P, P = Absolute pressure in receiver,

peia.

- Absolute atmospheric pressure,

V = Volume delivered by pump, cu. ft.

V. = Receiver volume, cu. ft.

= Time, min.

Note—Commenting on Prof. Johnson's equation, Mr. Hicks states that pump manufacturers generally prefer the tabular method although the Johnson method is more nearly exact. The assumption that the volumetric efficiency curve is a straight line does introduce error since most actual curves show a slight dip near the high vacuum end. However, the error from this assumption would ordinarily not be large.—Editor.

Editorial Viewpoints

Welcome, Chemical Industries!

We are pleased and proud to welcome Chemical Industries into the McGraw-Hill family. Its purchase on August 1, 1950, from the Maclean-Hunter Publishing Corp. provides a companion publication for Chemical Engineering and will round out McGraw-Hill's service and coverage of this rapidly growing sector of the American economy.

Since September 1, 1902, Chemical Engineering and its McGraw-Hill predecessors have served chemical engineers and technically trained management in the development, design, construction and operation of plants in the chemical process industries. This service will be continued, improved and expanded.

Since September 16, 1914, Chemical Industries and its forebears have provided a different and valuable service for those engaged in the business management of the companies that manufacture, consume and distribute the products of chemical industries. Its editorial emphasis has been and will continue to be on the news and significance of developments that affect all phases of chemical business and industry.

As companion publications, CE and CI will supplement each other, broadening their coverage and, at the same time, serving more effectively their different functions and clientele. Both will be geared to chemical progress, aware of increasing obligations and responsibilities in the years ahead.

As was announced at the annual meeting last June of the Manufacturing Chemists Association, CI's former editor, Robert L. Taylor, will shortly take up his new duties as MCA's Executive Vice President. We are sorry to lose Bob from business-paper editing, especially so because his first job after graduation from Michigan in 1936 was as Assistant Editor of Chem. & Met. But we are pleased that his able colleague and collaborator, W. Alec Jordan, has succeeded him in the CI editorship. Elsewhere we salute Alec as our "Man of the Month" and wish him and his fine staff the continued success they so well deserve.

Zealots, Beware!

Chemical additions to foods have become a basic issue of widening concern to many industries. It is an outgrowth of the long argument before the Food and Drug Administration about adding chemical softeners or emulsifiers to bread. Many who are not in the food business are now going to be forced to give attention to these problems.

Elsewhere in this issue we refer to the recent action of the Food and Drug Administration in omitting from its proposed bread standards specific authority for use of these chemicals. By failure to take positive action the use of such chemicals was effectively forbidden. And the reasons which lie back of the omission are extremely important.

A number of very zealous individuals in and out of official circles have repeatedly claimed that "greedy, selfish industry" will not willingly pass up the prospects of a profit even when the health of the people may thereby be jeopardized. No thoughtful person believes such charges. But they offer a wonderful platform for political demagoguery and they have been so used. Whatever the motive, the fact remains that this is a serious problem because the mud is thrown promiscuously, and sooner or later some chemical companies—even with the cleanest of records—are going to be smeared.

Fortunately, the Manufacturing Chemist Association has an able committee to follow closely the congressional proceedings which seem likely to begin late this fall. It is going to be important for chemical companies to keep track of these activities and to supply support and technical testimony, if necessary, whenever called on by the MCA committee. These presentations should certainly be made, but they should be made in a constructive spirit. Let us hope that no over-zealous industrialist loses his temper publicly. Mere retaliation will do no good; in fact, it will merely aggravate the attacks by the zealots who are causing the trouble.

A Korean Chemical Industry

Prominent among the August 1950 objectives of U. S. strategic bombers was an important group of chemical plants in the Konan district of North Korea. One of these had a yearly capacity of 500,000 metric tons of synthetic ammonium sulphate. Others produced calcium carbide and acetylene chemicals, soap and glycerine, solvay soda, aluminum and magnesium.

Konan's chemical plants were built and operated from 1930 to 1945 by the Shin Nippon Chisso Hiryo K.K.—one of Japan's largest and most diversified chemical companies. At the end of the war, all of these plants were taken over by Soviet Russia. Since then the only information on their operations has come from repatriated engineers who have returned to Japan stripped of all records and technical data. Corporate relations with the Korean subsidiaries of Nippon Chisso have been severed, and on January 12, 1950, it was reorganized as the New Japan Nitrogenous Fertilizer Co., Ltd.

Recent correspondence with T. Kato, chief of the liaison section for Shin Nippon, and Tomozo Maeda, aow superintendent of the original works at Minamata, in Kumamoto Prefecture, Kyushu, reveals many interesting incidents and data on their company's operations. In 1923 it was the first in the world to industrialize the Casale process for the direct synthesis of ammonia. Activities were begun in North Korea in 1930 with the installation of a hydroelectric plant to develop 200,000 kw., primarily to produce electrolytic hydrogen for use in ammonia synthesis. Later the company undertook a number of additional water-power developments, and by the end of the war had installed 1,600,000 kw. and had under construction five more power plants with projected capacity of 1,300,000 kw.

Of special interest to American chemical engineers is the fact that Shin Nippon in 1934 sponsored the first large-scale plant for the production of metallic magnesium using the thermal reduction process of the late Dr. Fritz J. Hansgirg. A separate subsidiary with a capital of approximately \$2,000,000 was organized for the purpose of manufacturing 2,000 metric tons per year of metallic magnesium at Konan. The fact that at maximum capacity it produced only about 65 tons per month after almost ten years of extensive experimentation, is now revealed for the first time in an interesting report by Mr. Maeda who was Dr. Hansgirg's close associate and collaborator during the years he spent in Korea.*

Tomozo Maeda's report was prepared in memory of Dr. Hansgirg and dedicated to his widow. It was (in his own words) "intended to be of some use as a particle of history and not as a thesis, because it is miserably lacking in accurate data and figures as we could not bring back even a sheet of drawing nor any document with us in repatriation from Soviet-occupied North Korea."

The Hansgirg process, as finally developed in Korea, did not differ greatly from the Kaiser installation at Permanente, Calif., which we described in Chem. & Met. (Sept. 1941, pp. 91-4). Its chief raw material was a relatively high-grade magnesite mined in a mountain area 270 km. north of Konan. In the final stages of the development it was necessary to use imported anthracite from Indo-China instead of Korean coke or petroleum pitch.

As was Dr. Hansgirg's experience in this country, most serious difficulties were met in the design and construction of the reduction furnaces and in the electrically fired equipment for distilling the magnesium metal. One disastrous explosion led to the abandonment of the continuous distillation process and the substitution of batch operations similar to those tried at Permanente.

When the process was finally abandoned by the Japanese in 1945, the plant had four sets of reduction furnaces of 1800 kw. and 3000 kva. transformers, 12 tablet presses and 49 sets of batch distillation retorts. More than half of these retorts were 1,400 mm. in diameter, electrically heated from the outside and built of steel to operate at a pressure of 20-30 mm. Hg. Each of the larger retorts had a capacity of one ton of Mg per batch and could be used only 40 times without complete rebuilding.

To the best of Mr. Maeda's recollection, the power and hydrogen requirements of the Konan plant in 1939 (per ton of Mg ingot) were as follows:

Power: Reduction furnace21,000	kwh.
Distillation furnace 6,500	kwh.
Remelting furnace 800	kwh.
Motive power 4,000	kwh.
Hydrogen: Cas for replenishment 2.500	cn. m

He states that these were probably quite excessive because of the low output of the reduction furnaces and their high heat loss of about 400 kwh. per hour.

Assuming that the magnesium plant has not been dismantled by the Russians or has escaped the American bombers, the natural question is whether it could be successfully operated. He concludes his interesting report with this comment: "At present the Konan Plant would certainly succeed in a commercial production if necessary raw materials could be procured. It must be borne in mind, however, that the thermal reduction process of Dr. Hansgirg needs a careful operation in various points. Without a wide experience, an accident like an explosion may occur as we once experienced." So ends what presumably is the final chapter in the history of Dr. Hansgirg's ill-fated process.

Forever Never Built

One engineer we know recently took a look at the spectacular postwar construction figures for the chemical industries and said, "It can't go on like that. At last the chemical industry, practically speaking, is built." We insist that this is not true.

Just chart the dollar volume of new private industry construction since about 1923. The first thing you will notice is a trough of subnormal activity during the 1930-40 "depression decade." Do you think that that towering peak of 1945-50 is more than enough to fill up the trough and still give a high plateau to the curve? It isn't.

For there is one catch in the picture: the 1945-50 dollar has been a shrinking one. Now correct the chart to a 1939-dollar basis to show the true "physical unit" increase. This curve loses its steepness and clearly shows one thing: the chemical manufacturing industries have not yet satisfied their need for more physical volume. The need, of course, will go up sharply as our preparedness program gathers steam. New construction in our industries will be heavy for many years to come.

Now, more than ever, it is true that the chemical process industries are "always building—but never built."

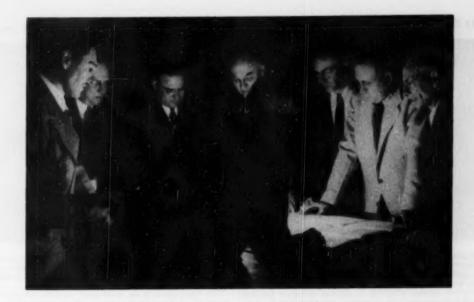
By odd coincidence, Dr. Hanegirg died in Yonkers, New York, on July 23, 1949, exactly 15 years after he had signed the contract for the Konan plant.

DEPARTMENT OF THE MONTH. This department appears in each issue among the ads. Are you using it? To call it to your special attention we are starting it here this month

New Technical Literature

Reader Service numbers. Circle them on the postcard inside the front cover to get free booklets.

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Hyphons 126C	Hyphone which operate on the jet principle utilizing the energy of etsam under pressure to pump, heat, mix liquids and handle solids. Photographs and color drawings show operation and working parts. In tabular form are sizes, dimensions, prices, expectics of each type. Special purpose and corrosion models are shorton. Typical applications are shortoned. 24 pages.	Schutte and Kuerting Co.
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lipeed Reducers 128F	Illustrations of various types of worm grar speed reducers. Selection tables, horse- power rakings, overhung load rating tables, dimension tables with dimensional sketches. Vertical speed reducers for cooling toner service are illustrated. 32 pages	De Laval Steam Turbine Co
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		(Continued on page 256)



PRODUCT DEVELOPMENT

Progress in the chemical process industries rests squarely upon the ability to develop product ideas into product realities. If there is a universal formula by which this is done—it has yet to be disclosed. In the meantime luck, logic and ligison among mens' minds must suffice.

CHEMICAL ENGINEERING REPORT—SEPTEMBER 1950

r all began when an enterprising caveman laid aside a trusty club in favor of a more efficient sling and stone. New product develop-ment as the pacesetter of civilization came into being and mankind was off on a never ending quest to improve upon its own products as well as those of nature.

Through the centuries that followed, the basic human wants for food, security and comfort demanded ever more elaborate means of satisfaction. Needs compounded upon needs and skills had to be developed within skills to anticipate and meet these changing requirements. As a consequence, profit and progress were made by the men and organizations who were best able to bring a product and its uses together and keep them together.

But this is no news to the chemical process industries. Their very history is written in terms of new product development and their future is staked upon their ability to pick and develop the compounds that have the most dollar

signs in their molecular structures. Yesterday's waste products often become today's profit makers. Tomorrow's big sellers now fill the minds of research men or the sample bottles that line the walls of their laboratories. Whether or not these hopefuls mature to a full useful life depends largely on the care with which they are reared through the tender "impressionable"

years of commercial development.

The fundamental purpose of all new product Products development programs is to sell more goods and domand gain greater profits. This is embodied in the uses.

following specific objectives:

1. To keep the company's products and product lines in a strong competitive position.

2. To advance byproducts or waste products

to a profitable status.

3. To diversify the product lines and therefore the industries that can be served.

4. To improve or replace products which, because of market saturation, have shown declining profits.

Fly Spray or Motor Oil—Proof of the product is in the using



Testing the efficacy of allethrin in dairy cattle sprays was an important factor in the development of this new insecticide by the Carbide and Carbon Chemicals Division of the Union Carbide and Carbon Corp.

Carbide became interested in allethrin when its synthesis as allyl cinerin (synthetic pyrethrum) was announced by a re-search team of the United States Department of Agriculture in March 1949. Carbide decided to develop the compound to a commercial level and began by making extensive chemical and biological evaluations of the product in their own laboratories and the groups maintained by Carbide Fellowships at the Mellon and Boyce Thompson Institutes.

By late 1949 the research and marketing studies were completed and enough of the compound was prepared to permit exhaustive tests to be made. The compound was formulated into the kind of spray mixtures that would be used commercially and evaluated in terms of the standard Peet-Grady technique. This testing revealed that allethrin was extremely toxic to insects and the equivalent of the natural pyrethrins in most respects and superior in others. Other tests showed that it was relatively non-toxic to man.

A 12-step process employing 11 intermediates was worked out for the production of allethrin. Fortunately, because of the versatility of Carbide's plant facilities it was possible for the company to make all of the intermediates required.



Road testing, first in the Texas Co.'s own test fleet of cars and then in the bus and truck fleets of interested customers was the proof-by-use step in the development of Custom-Made Havoline motor oil.

The new product is the result of an intensive development project of the Texas Co. initiated in 1946 to improve the competitive position of the company in the motor oil field. The aim of the project was to produce an oil that would have a higher viscosity index, a lower pour point and give better engine performance than previous oils. In addition there was a desire to endow the new oil with a character that would make it qualify as a heavy duty oil for use in diesel engines.

An analysis of the problem showed that its solution hinged on the selection and optimum blending of improved additives for oxidation resistance, detergency, and dispersiveness in a good base lubricant. Additives constitute anywhere from 15 to 30 percent of the production cost of a motor oil. For this reason the wide evaluation of several additives had to be conducted from both economic and technical standpoints. Comparative tests were also run on the motor oils of leading competitors.

After laboratory testing the new product was released in pilot plant quantities for road testing. Thousands upon thousands of test miles were run off under various sets of engine conditions and climatic envircaments. The results of these tests suggested some last minute changes in the formulation of the oil.

People engaged in development work view the above objectives as finding new products for new uses, new products for existing uses, or new uses for established products. Many companies feel, however, that this last function should be the concern of the application laboratories of the division of the company charged with the production and sales of that product. They argue that the company has most to gain by concentrating its development efforts on products that are distinctly new.

Develop-

Development is often considered as an extension function of the research department. But organiza- in the last 20 years most large and medium tion sized chemical process companies have swung over to the opinion that it is best handled by a company-wide department or divisional departments created for that purpose. Among these organizations there is a wide variance in the name, design and operational scope of such departments. This is due largely to different

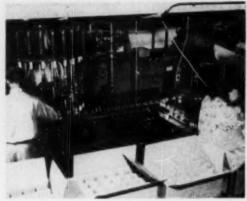
people's conceptions of the word development."

In some instances the development depart- One ment's main function is defined as that of idea bridging the gaps between the research, production and sales departments. Here its principal service is that of internal co-ordination. It is often charged with the technical development of the process by which a new product will be made and the rendering of technical assistance to the sales department when the time comes for the product to be sold. Critics of this arrangement claim it tends to add duties of process development and technical service which in their opinion should be the responsibilities of other groups.

Most of these critics of course, are graduates Another of the school of thought on the opposite end idea of the scale and think of development mainly in terms of sales development. In their companies the development department is concerned with the external tasks of market analy-

Drug or Detergent-Packaging is part of product development





Cortisone, like all injectable drugs, is packaged in measured nantities and under sterile conditions. The process for the quantities and under sterile conditions. conversion of the factory bulk cortisone into a sterile form ready for use by physicians was one of the major parts of the program by which Merck & Co., Inc., developed this new drug. Successful synthesis of cortisone in 1946 by L. H. Sarett of

the Merck research staff was a highpoint of 11 years of intense interest and activity by the scientific world in the field of adrenal cortical hormones. The synthesis required more than 30 separate, delicate and carefully timed chemical reactions. even the small quantity needed for clinical testing of the drug required a great amount of development work to be expended on

The pilot plant transition to production was extremely crit-A small loss of product yield in any of the numerous steps would have been multiplied progressively through succeeding steps. Late in 1948 the first quantities of cortisone were made available, but the supplies were limited to only a few grams. Currently the production has reached a point where it is measured in thousands of grams a month. At first cortisone or Cortone, the Merck trade mark name for the product, was available only for investigative use. But recently the company announced that increased production had made it possible for them to release the drug to over 6,500 properly equipped and accredited hospitals in this country.

Packaging was one of the major considerations in the development of Glim, a homehold detergent for dishwashing. During its history four different bottle types were tried in an effort to pick an attractive one that could be easily handled by the packaging machinery, the dealer and the housewife.

Glim is a modification of an industrial detergent that prior to 1940 was used for wool scouring. Its present application evolved out of a broad program of the General Aniline and Film Corp. to find new uses for some of their principal detergents. For the single purpose of hard surface washing approximately 25 detergents were screened. It was this branch of the project that brought Clim to the forefront as a household surfactant

Comparison tests were run on competitors' products and test campaigns were designed to sound out consumer acceptance. At first Glim's developers were afraid that the old adage about housewives' reluctance to buy liquid products might hold true. But the results of surveys showed that this was not the case. Over 2,000 samples were distributed across the nation in both hard and soft water areas. This was followed by test sales cam-paigns in several cities. Follow up surveys of grocers' inventories showed that the product was enthusiastically received.

It was subsequently decided that the merchandising of Clim could best be handled by a firm with an established distribution setup. For this reason the sales rights for Clim were sold to the

B. T. Babbitt Co. in 1948.

"Pilet сотролу" approach

sis, customer usage evaluation and extension and the general technical problems concerned with the launching of a new product into a competitive situation.

There is a third philosophy of product development organization that differs from and yet includes both of the above. This is what might be called the "pilot-company" approach. The product development department considers itself, and operates as, the management of a subsidiary company with a new product idea. It appropriates and uses all the facilities of the main company required to develop the idea to a point where the eventual product has an established competitive sales position. Armed with a proved sales record the "pilot-company" is then in a position to recommend that the new product be inducted into the regular manufacturing and sales programs of the company.

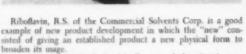
This type of product development, though expensive, has paid off handsomely to the companies that employ it. In effect it makes the development department a part of top level management in planning the future technical course of the company. As chemical process based enterprise continues to grow and spread into other fields there is every reason to believe that the "pilot-company" type of development will become standard practice.

The spirit it produces is similar to that found Linison in the small or specialty chemical companies of where "development" consists of the chief lunch chemist, sales manager and production superintendent eating luncheon together twice a week. In this informal atmosphere the salesman can present a customer's need, the chemist, a product to meet it and the production man, a way to make the product at a profit.

But the cycle can go in the other direction too. The product and its potential uses may first be suggested by the chemist and its manufacturing and marketing problems worked out

Body Nutrient or Basic Chemical-New form means new product





Commercial Solvents had originally entered the vitamin production field as an unexpected consequence of its expansion in the production of butyl alcohol. Over a million gallons of liquid fermentation wastes were being dumped daily by the company's Peoria plant into the Illinois River. To cease polluting the river it was suggested that the waste be evaporated to a solid and carted away. But analysis showed that the waste was rich in riboflavin and so in 1938 CSC began the manufacture of riboflavin supplements for me by manufacturers of poultry and

The demand for the product became so great that a new process was installed at the Terre Haute plant of the company in 1939 for the production of large quantities of pure crystalline riboffavin by deep vat fermentation. This material was for human consumption.

Unfortunately, the product had a solubility of less than 100 mg per liter in water at room temperature. This limited its pharmaceutical use and research effort was directed toward the development of a readily soluble crystalline riboflavin. This was a successful undertaking and culminated in the product riboflavin, R.S. with a solubility of 1,200 mg. per liter.



Flake formaldehyde evolved out of a research program of the Celanese Corp. of America on formalin derivatives that might have a strong sales and use appeal in the industrial market. The program had also been prompted by a desire to find a more economical form in which to ship and use formaldehyde than as the 37 percent commercial solution, formalin.

Paraformaldehyde, the crystallized polymer of formaldehyde had long been made and marketed in a powdered form by other companies. But its use was limited to certain specific applications because the cost of its production was considerably greater than that of formalin.

By the end of 1948 work in the Celanese laboratories indicated that a flake paraformaldehyde might be produced as a general replacement for formalin. A pilot plant was built the following year and a large scale market analysis and development program was begun. Primary efforts were concentrated on the flake product but powder grades were studied too. About 700 samples of the new product were distributed to requesting or-ganizations during 1949. Over 160 of these were considered potential volume mers,

The decision was made to set an 11 c. per lb. base price on the material (91% flake formaldehyde) fob. the plant. This figure was established as being low enough to capture and encourage the interest of present formaldchyde consumers who were paying 3.5 c. for 37 percent formalin.

by the production man and the salesman. Either way it embodies the conviction held by large and small companies alike that development is a two directional highway between need and product.

There is no single font of ideas for new products. They spring from many sources both inside and outside a company. Ideas begging development come from the development department itself, the research and engineering departments, the sales force, non-technical personnel, consultants, stock-holders-and according to one development manager from "anyone who breathes and is blessed with imagination."

As would be expected men in the research and engineering departments are heavy contributors of new product ideas. Their attendance at meetings of technical societies and perusal of scientific literature puts them in a good position to uncover germs of ideas that might be developed to commercial success. Their

suggestions may be counted upon to be technically sound though sometimes lacking in marketing feasibility.

The sales department, on the other hand, Salesmen usually bases its proposals upon a knowledge of are a good customers' needs and the sales position of com- source petitive products. Salesmen may at times overestimate the extent of a potential market or under estimate the technical difficulties to be encountered in the manufacture of a new product. But suggestions from this source always have a strong marketing flavor that is helpful in considering a course of product dev-

Non-technical personnel cannot be considered as a major source of new product ideas. Their general unfamiliarity with market conditions and production techniques does not permit them to formulate practical ideas from a technical or marketing standpoint. But now and then this very condition works to make them see "forests"

Ideas ere ctorties materials

while the researchers and salesmen are blinded by "trees." For this reason enterprising managements set up remunerative suggestion systems.

Research institutes, consultants, and government and university laboratories are the biggest sources of new product ideas outside the company. But the occasional inventor with a half formed thought for a new product application

cannot be overlooked either.

goot ideas

Lats of

New product development is an expensive undertaking both in time and money. To conserve this investment it is necessary that the sheep and goat ideas be separated as early as possible in the development procedure. Many of the chemical process companies believe that this screening can better be accomplished by formal or informal development committees than by individuals. The personnel makeup of such committees will vary from company to company but it usually contains representatives from the research, development, production, sales and legal departments. If the idea calls for the eventual erection of a large commercial plant, members of the engineering and purchasing departments will also be asked to advise. Frequently as not, the group chairman will be a member of top management, reporting directly to the president or the board of the company.

New product ideas submitted to this committee are examined and evaluated in the light of many criteria. The factors usually considered are those listed in the excerpt from the National Industrial Conference Board Report on "New Product Development." But perhaps the most universal question asked by chemical process companies when considering new products is "How far should we wander from our own

original field?"

Each product idea demands an individual answer to this question, but a few generalizations can be made. The area of the chemical process industries is great enough to permit quite a lot of wandering, but the paths and their destinations must be well picked. With the exception of the petroleum and the drug industries for instance, most chemical process companies

tend to shy away from product ideas that might land them squarely in the middle of a consumer field. Although there are many notable exceptions to this feeling, they prefer to remain in the role of the supplier of raw materials to the consumer serving industries. This position, they claim, is closer to their basic interest and obviates the need of developing production and distribution-for-consumer facilities.

However, the ability to use existing plants, knowledge and personnel has caused many companies to develop and manufacture products quite foreign to their original scope. An example of this is the successful venture of chemical companies, familiar with fermentation processes, into the large scale production and distribution

of antibiotics.

Conversely many concerns are forced to acquire new specialized knowledge, facilities and for old" personnel to develop and manufacture previously unconsidered products to maintain or enhance their company's established competitive position in its original field. This is exemplified in the wholesale migration of soap companies into the manufacture of synthetic detergents in recent

Authorization for the initiation of a development project is made by management after a study of the recommendation and the development budget submitted by the development group. The exact level at which the authorization is granted differs among companies and according to the size of the predicted expenditure. Some development departments or steering groups have funds at their disposal with which to pursue general development work or the development of projects within specific areas of the company's activities.

Financial aspects of the project and its goal Venture are carefully considered at this point and it vs seems that every company has developed a pet sain formula for determining how much it should invest per degree of development promise. Books have been written on the subject. But in the last analysis experienced judgment of calculated risk and return is the common denom-

Factors Commonly Considered in Evaluating Product Ideas

1. What purpose will the product serve? Will it improve our quality, lower our costs, etc?

2. Would the product fit logically into our existing line of prod-

What is the anticipated market demand? Are the potential applications for the product broad or restricted? Will the product

 be a large volume item or a minor item in the line?
 4. Will it be possible to sell the product through our sales force and channels of distribution? If not, what will be the cost of promoting and establishing new channels?

- 5. Can the product be sold, in general, to the same consumers or class of trade as our existing products?

 6. Can the product be manufactured and sold competitively?
- 7. How long would it take competition to copy or imitate the

Is the product technically practicable?
 How long would it take to develop the product for market?

10. Can the item be patented?

11. Could the product be manufactured by utilizing our existing plant facilities or to what extent would those facilities have to be expanded?

12. Can the product be manufactured from easily obtainable naterials? Are these materials in common use by the company?

- What sizes and types would be required?
 Can the product be packaged in containers that are generally used in the business?
- 15. What effect will the introduction of the product have on en-
- 16. Does the company have the man power available or reason ably obtainable to develop, manufacture and introduce the product?

 17. What would the development cost be?

18. Could these development costs be absorbed over a reasonable

period of time? 19. What is the estimated return on the investment?

20. Is the item a long-profit or a short-profit item?

- 21. How much profit should the company be able to make and
- 22. What effect will the product have on our "break-even" point?

 23. Are we financially able to develop and introduce the product?
- 24. What are the prospects for the product on a long-range basis?
 25. What is the probability of successful development and introduction of the product? National Industrial Conference Board

nator. It cost the Du Pont company \$27 million to develop Nylon!

Patents protection

Patent considerations also loom large in the early stages of the development of an idea. The prospect of obtaining a patent on either or both the product and the process by which it will be made is often a major determinant of whether or not to go ahead. Preliminary patent effort is therefore in the form of an evaluation of the status or dominance of existing patents for competitive or near competitive products and processes. Once a patentable position is forseen for the new idea, the emphasis shifts to that of solidifying the patent structure that must surround it as it develops. Broad based patents to cover most contingencies are usually applied for in the early stages of development. These are succeeded by narrower and more specific patents as the project begins to settle along definite Many times however, as the work progresses, the original patents are found to be not broad enough. More embracing protection must then be sought in the final stages of development especially with regard to families of products.

Once a project is authorized, one of two courses is usually followed. If the company is large and its interests very diversified, a group may be formed to guide the course of the project and coordinate the efforts of the various departments that will work on it. If this is not feasible, a direct assignment of the project may be made to a member of the development department who will father the infant idea through

to maturity.

There is no standard pattern for new product development that can be assembled and presented as a universal dictum. Practice varies from company to company and even from product to product within the walls of any single company. About all that can be said is that the mechanics of a development consist of required technical steps and economics-based moves interspersed in a sequence dictated by the indement of the group in charge

The tactics or even the over-all strategy of a development project may be changed overnight by the discovery of a fact or situation not foreseen in the original planning. This happened in the case of a company that was enthusiastic about the solvent properties of an organic compound developed by their research laboratories. A great sales future was predicted for it as an extractant and concentrating medium for essential oils from whole spices. But toxicity studies revealed that the compound's dissolving powers also extended to the protein matter in stomach linings. Today, because the development prograin was flexible enough, the compound is enloving tank car quantity usage as a solvent for aconer

The technical steps in a development project usually follow a distinct order of research to pilot plant to commercial plant. But the intensity of time, money and effort spent on each of these will vary all over the lot. Drug companies, for instance, will keep a development project in the laboratory research stage for considerable time. It would be folly for them to build a complicated specific pilot plant until a detailed animal, or clinical evaluation of the product gives reasonable assurance of its efficacy and safety. Laboratory scale synthesis will usually yield sufficient amounts of the product with which to perform the evaluation. And the evaluation itself may suggest that a modification of the molecular structure of the product may produce a compound of greater efficacy, and lower toxicity and possibly easier or cheaper manufacture.

Petroleum companies are noted for the em- Smallphasis they place upon the pilot plant interval scale in the development of their new products. The mistakes general size and cost of their commercial plants don't hurt and the tonnages in which they produce their mainline products have made them very conscious of the harm an unironed-out process "bug" can cause if it is allowed to sneak through to full scale production. They subscribe to Backeland's famous description of a pilot plant as an instrument to "make your mistakes on a small scale so that your profits can be on a large one." Then too, most petroleum products to be tested adequately must first be available in quantities larger than can be produced econnomically in laboratory equipment.

Companies in the business of producing low cost heavy materials in large volume understandably give considerable attention to the design of the commercial plant in which a new product will be produced. Examples of this can be found in the fertilizer, cement and refractories industries where the problems of materials handling may outweigh those of a chemical nature. Many of their pilot plant runs consist of using their full scale production equipment with modifications to make trial batches of the new product. The design of the commercial plant for the new product will be based largely upon ob-

servations made at the time.

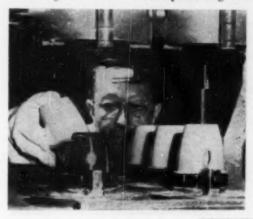
But regardless of upon which technical step in the project the major emphasis is placed, if upon any, the greatest economy in the development procedure is realized when each of the steps is given the optimum time and effort necessary to accomplish its particular purpose in the whole scheme. This requires good timing. A slow but sure pace of development through the various technical stages may work to give competitors a marketing edge. Conversely a fast gait, though it results in an immediate sales advantage, may also yield a product that will suffer an eventual marketing letdown.

Application research, therefore, is a particu- Who larly important part of development work. It explores begins at the basic research stage and continues wses? long after the formal introduction of a new product. In highly competitive situations it never really ceases. In the case of products that are intermediates or raw materials for other industries, the question eternally rises of how far the company developing the product should also develop its uses. The answers to this question, like everything else about development, cover a wide range.

Everyone agrees, however, that a use recommendation should be based upon a thorough proved-in-practice study. This type of exploration can be very costly if there are many potential uses to be investigated. Sometimes

Reversing

Coaching the customer in cup making was part of development



The study of customers' molding problems was an important feature of the program by which the American Cyanamid Co. developed its melamine-formaldehyde resins. A good example of how this phase of the work paid off is that of the extensive use of these resins in the molding of plastic tableware.

Melamine resins were a direct outgrowth of Cyanamid's develop ment program on the base chemical melamine, which is the trimer of cyanamide. The company had long been interested in this compound and obtained the rights of a process invented by Ciba in Switzerland during the late 1930's. It was necessary. however, that many refinements be worked out for the process to make it commercially fessible in this country.

During World War II melamine retins received their big development push. In molded form they were used in great quantities in aircraft ignition parts. They were also combined with glass cloth to make laminates or used directly as adhesives.

After the war the development effort was redoubled and the true consumer potential of the resins became apparent to the industry and the public. New plants were built and existing production facilities enlarged and improved. Extensive application studies were conducted and are continuing to determine how and where the melamine resins can best be employed.

Testing & toxicology

Judgment

reinforced

it is necessary to retain consultants, familiar with the customers' processing needs, to advise the development group. In other cases, one or more of the possible users of the material may have drawn into the development project.

Comparative tests on competitors' products and the performance of toxicity studies are two other important facets of the research contribution to development. Often the only way to establish a competitive position against a new rival product is by the creation of a new improved" product. And toxicity studies have become a "must" even for the products not intended for human consumption. The toxicology of the dust or fumes of a heavy chemical must be examined as critically as the side or after effects of a new drug or cosmetic.

Most development men agree that although research is expensive it is still cheaper than a major fault at the pilot plant stage or a minor fault in the design of commercial production facilities. For this reason they argue that if any doubt exists about the manufacture or application of a new product it is best that the development project linger at the laboratory stage. Once committed to leaving the laboratory, however, it should be pursued diligently through

the remaining steps.

But there's more to project scheduling than good judgment. From the outset of a developmust be ment, technical evaluations and marketing considerations must be brought in. What at the start may have been a ripe market for the contemplated product may have been harvested by an enterprising competitor in the meantime, and embarrassingly as it may be, with a technically superior product. This situation demands a decision of whether to abandon the project or go ahead on a campaign of improvement. Then too, a market analysis may show that although a need exists for the product under consideration the market will not bear the estimated sales price of the item. The extrapolation of cost studies based on pilot plant operation provides a means of deciding whether, and if so how, the eventual production costs might be lowered into a competitive range. This may entail referring the project back to the laboratory for further fundamental exploration of raw material possibilities and other factors or the modification of the process at the pilot plant level.

Progress reports play an important part Reports throughout the entire development project in keep all keeping the management and the various de-informed partments concerned informed. These reports are written by the development personnel in charge of the new product or members of the department handling the project at the time, or both. In small or medium sized companies where interdepartmental contact is easily effected reports serve mainly as a guide to patent counsel and those concerned with the budgetary aspects of the project. But in large companies such reports are the principal means by which management can keep abreast of the status of many new products. Usually the successful operation of the pilot plant is the signal for a comprehensive report to be written about the entire development. This missive gives the engineering and production departments the processing data accumulated to date. It also ists the physical and chemical properties and prospective use data for the guidance of the sales and advertising departments in their promotional activities.

The intracompany circulation of this report Man puts a lot of executive machinery into operation simultaneously. The patent situation of the whist new product or process must be rechecked and a name or symbol that can later be trademarked selected for the product. Toxicity studies must be completed. Local, state and federal regulations governing the shipping and marketing of the product must be ascertained and satisfied. Imagine the predicament of the large manufacturer of organic chemicals who came up against a state law that forbade the sale of formaldehyde by anyone but a registered pharmacist. And then the sale had to be in non-lethal quantities.

Other moves at this time include the formulation of a price policy and a distribution program. The pricing formula evolves out of a

Patents and Potency-Rechecked in the library and laboratory





Denss rehearsol study of the results of market analyses and the cost of the entire development. And dealer arrangements in turn depend upon price policy.

But before a commercial unit is erected or the new product released for general sale a final dress rehearsal is usually performed. In the case of an industrial product this generally means the distribution of pilot plant quantities of the material among old customers who might be interested. Good or bad points often come to light that should be exploited or corrected before the product is added to the company's regular line. During this period customer criticism is eagerly sought and acted upon. This is why most companies prefer to let this type of sales introduction be handled by the development staff instead of the sales department.

The introduction of a consumer product is prefaced by local sales campaigns and follow-up surveys to determine consumer acceptance. The information gained is valuable in the formation of a general production and sales program for the new product. If the market analyses have been accurate and the introductory or localized sales campaigns successful, the product is then turned over to the sales department for the big

Self &

From this point on, the major problems are those of merchandising the material and producing enough of it to meet the demands that merchandising stimulates. To capitalize upon the initial interest aroused, production must be closely keyed to demand but without dangerous overexpansion. The enlargement of the pilot plant's capacity to that of a semiworks is one device often used to tide over until a commercial installation can be built. Another is that of switching over existing production facilities intermittently to short runs of the new product. This, of course, can only be done when the equipment lends itself after slight modifications to the processing of the new material,

Such arrangements, however, are only stopgaps in the development of a new product to a permanent commercial position. They afford a last chance for evaluating the market and the production requirements prior to the erection of a full scale plant or plants. During this period all remaining doubts must be removed from the scene. For although the pilot plant is a relatively expensive production unit it is still cheaper than a prematurely built fullscale in-

The planning for a commercial plant involves Planning considerations of location such as proximity to the plant raw materials sources, distribution areas and a good supply of skilled labor. The immediate capacity of the plant must be set and provision must be made in its design to permit an expansion to greater capacity if the demand warrants.

All of these factors bring up the problem of financing the plant construction, perhaps the biggest decision of all to be made. Money might be spent loosely in the early stages of development when learning how a thing cannot be done is almost as important as learning how to do it. But when the time comes for funds to be raised and allocated for the erection of commercial units, money assumes a new importance. It is then committed to a mission from which there can be no turning back.

As the first grams, pounds or tons of the new product emerge from the production line the development project can be stamped "complete." From start to finish it may have taken anywhere from 10 months to 10 years to accomplish. Seven years is accepted as the general average but there are cases on record where it has taken nearer to 20 years for a product to burst forth in full rewarding commercial bloom.

But in another and larger sense a develop- Product ment project is never finished. New and yet progress newer applications for the product have to be profit found and similarly more efficient ways to make The material itself may have to be altered from time to time to fit into the changing picture of use. For this reason new product development is more than a function of enterprise . . . it is a spirit . . . which like the progress it engenders goes on and on and on.

Throw Your Wastes Down a Well

- YOU CAN dispose of many wastes by pouring or pumping them into the earth. This is possible . . .
 - IF you have a well or can drill one in the right rock formation.
 - IF the waste is clear and stable and doesn't contain fibers or suspended solids.
 - IF the waste will not corrode equipment or react unfavorably with the rock.
 - IF state laws will let you.

JAMES A. LEE

In this day and age the disposal of wastes from chemical plants is a problem of considerable magnitude due to restrictions of regulatory bodies. For the past 20 years oil well brines have been successfully returned underground via deep wells. In fact the practice has become standard, whereever possible, in the production division of the petroleum industry. This means of waste water disposal is receiving increased attention by chemical companies along the Gulf Coast and in other parts of the country. Dow Chemical Co. has used wells at Midland, Mich., for several years. Mc-Carthy Chemical Co. put in a well when its plant was constructed two years ago at Winnie, Tex. A chemical company in Oklahoma has used one for several years. And E. I. du Pont de Nemours & Co. is planning to use a well for some of its waste water at

its Victoria, Tex., plant.

Disposal wells should always be drilled into a porous rock formation in which the water present is not suitable for any known use. This generally means below the source of fresh water produced in the area. If this practice is not followed contamination of water useful for consumption or irrigation purposes may lead to lawsuits, or infraction of state or county regulations. Permission to dispose of wastes in formations selected for the purpose will have to be obtained in several states which have regulatory organiza-

tions.

Wells are drilled so that the lower end is in either sandstone or limestone formations. In all cases the operator endeavors to locate as permeable rock as possible to serve as the receiving stratum for his waste waters.

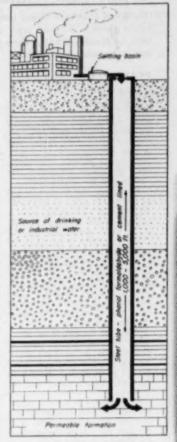
The capacities of the different rock formations to receive water vary greatly. Cavernous limestones are particularly suitable for the purpose as a well in such formations can receive large volumes of wastes per minute without need to resort to pressure. Formations that are already saturated with water or are impermeable will take little water in spite of the application of pressure at the surface. In some areas no suitable formations exist.

Plants having to dispose of very large volumes of wastes can use injection wells for disposal only if they are fortunate enough to locate a highly permeable formation beneath their property. Under certain circumstances a well drilled into an impermeable formation can be used even though it will take only a small volume of waste and then only at high surface pressures. Such a well might be justihed. If the waste were particularly objectionable, its removal from the main disposal system of the plant might improve the characteristics of the remaining waste so that it could be easily disposed of.

Experience has demonstrated that in most porous formations the use of several small wells is better than one

large well.

Waste material to be disposed of must be clear and chemically stable to avoid plugging the porous rock stratum. Other principal requirements of the wastes are (1) that they remain free of suspended solids, particularly fibers such as appear in pulp and paper mill effluents, (2) that they do not react unfavorably with components of the rock underground which they come in contact, and (3) that they do not corrode equipment.



Solids that escape the removal process and are injected into subsurface formations do not penetrate the sand or limestone. They gradually accumulate on the face of the sand or limestone formation, as the case may be, and form a muddy-like coating. While in most cases the water is put into the well by gravity as the coating accumulates it becomes necessary to force the waste solution down the well by pumping. As much as 500 lb. surface pressure is used at times.

In order to remove the accumulations in the well which decrease the penetration of rock it is customary to back wash. The time interval between such cleaning operations depends largely on the efficiency of removal of objectionable sediment by the surface treatment process, which includes

JAMES A. LEE, our Southwestern Editor, passes a known technique from one industry to another; from petroleum to chemicals.

What Size Caustic Cells?

The trend is toward larger units. Under most conditions, the newer Hooker S-3 cell gives a higher return on investment than the Hooker S unit. Here are figures that show how much and under what conditions.

DEANE O. BUBBARD

Some of the earlier causticchlorine electrolytic cells were designed to operate at 1,000-1,500 amp. Today most caustic plants are using cells designed for much higher currents. One French firm is now starting up a plant with 50,000 amp. mercury cells—about twice the size of the largest cells operating in the United States.

How does the Hooker S cell compare with cells of larger and smaller size? In plants with a capacity as low as 5 tons per day, it is more economical to use Hooker S cells at 8,000-10,000 amp, than smaller cells. In plants of about 50 tons per day or more, a 20,000-amp, cell could be more economical than a 10,000-amp, one. This is why the Hooker S-3 cell was recently designed to have about twice the active electrode area as the familiar S cell.

What are the returns on investment for these two types of Hooker cells for a 50-ton plant? Assume steam at \$0.40 per 1,000 lb. and power at 3, 5 and 7 mills per kwh. Fig. 1 shows that the

D. O. Huddard is senior chemical engineer with Hooker Electrochemical Co., Niagara Falls, N. Y. He gave the data in this article at the Houston meeting of the American Institute of Chemical Engineers on February 28 of this year. S-3 cells give a higher return under most conditions. Examples: (1) with 7-mill power, the optimum operating point is 12,000 amp. for the S cell and 20,000 amp. for the S-3 cell; (2) with 5-mill power, the points are 14,000 and 24,000 amp. respectively; (3) with 3-mill power, they are 15,000 and a little over 32,000 amp.

Here are conclusions from the \$ 38 data in Fig. 1: (1) return on investment increases as the unit power cost decreases; (2) optimum 34 operating points move toward higher currents as the unit power 20 cost goes down; (3) most of the curves are relatively flat. This third feature is fortunate since some of 26 the optimum currents are well above the safe carrying capacity of 22 the leads; otherwise there would be a temptation to overload and possibly burn out connections between cells. It is true that the copper in these could be increased; but so would the capital cost and difficulty of making good connections. There would be little--if any-gain.

What are the returns on investment for the S and S-3 cells for plants of different sizes and at optimum operating current for each of the two cells? Assume steam at \$0.60 per 1,000 lo. and power at 5 mills per kwh. Fig. 2 shows that (1) the S cell reaches its maximum

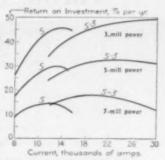


Fig. 1—Returns on investment for Hooker S and S-3 cells for a 50-ton plant. (Steam at 40c. per 1,000 lb.)

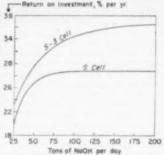


Fig. 2-Returns on investment for S and S-3 cells for plants of different sizes. (Optimum current; 5-mill power; and steam at 60c. per 1,000 lb.)

with a plant of about 110-ton capacity; (2) the S-3 cell approaches its maximum at 290 tons; (3) after the maximum point, the curve for each type of cell remains constant or nearly so; (4) the difference in returns becomes less as the size of the plant goes up.

some type of settling or a filter. Inhibition of bacterial growths is very necessary. Some deep wells operate for several months while others require frequent back-washing to sustain injection rates under gravity flow or moderate pump pressures.

In the East Texas oil field it was found necessary in the case of some wells to back wash them every 30 to 60 days. This operation is performed by injecting high-pressure gas into the annulus between the flow string and the casing, causing the gas to flow down the annular space to the bottom of the flow string, into the flow string at this point, and upward and out of the well bringing with it fluid from

the formation. By thus reversing the well flow, solids on the face of the formation are washed out of the well.

In a particular instance, after about two years it was found that enough coating had accumulated on the face of the sand or limestone that it was necessary to remove the solids with acid. To do this the steel tubing was first removed from the well. Mud acid consisting of HCl, HF and an inhibitor was put down the well. The acid remained in the rock formation long enough to dissolve the solids on the face of the formation. A gas lift was then used to force the acid mud and dissolved material to the surface. This cleaned out the well thoroughly

and restored it to good condition. The cleaning required from 2 to 5 days.

At the McCatthy Chemical Co.'s plant, in the fractionating system for separation of formaldehyde, acetaldehyde and methanol, a residue consisting of a water solution of salts of organic acids was withdrawn from the base of the fractionator where methanol and water vapors were being removed prior to their final separation. This waste residue was disposed of by mixing it with oil well brines from a nearby field, filtering to remove solids and pumping the mixture down a well into porous sands containing salt water 1,900 ft. below the surface.

ning to use an injection well to dispose of part of the waste water from the nylon salts plant under construction at

this time.

A chemical plant in Oklahoma disposes of its entire waste water in a well. The waste contains carbon particles and metallic hydroxides in suspension. The latter result from corrosion of the equipment. Before injecting into the well the waste water is passed through a sand filter. The formation into which the waste flows is limestone containing some brine. When the well was first completed it was given an acid treatment. This has been repeated at intervals of six months to open the channels.

At Fremont, Tex., the Magnolia Petroleum Co. is operating a natural gasoline plant where it is necessary to dispose of waste water from the cooling towers and boilers. The water is treated with sulphuric acid to preserve the redwood towers and prevent growth of algae. Sodium chromate is added to reduce corrosion and scaling of heat exchangers and phosphate is added to boiler feed make-up. Waste waters are given a chemical treatment and filtered before disposal in two

injection wells.

Several years ago Dow Chemical Co. at its Midland, Mich., plant pumped a waste brine liquor down a well completed in a stratum about 900 ft. below the ground surface. The brine was thoroughly filtered before pumping. The operation was quite successful. However, the project finally had to be abandoned because in that area there are several faults which gradually constituted channels in the stratum. They allowed upward flow which polluted fresh wells.

Recently, Dow has done some experimental work in pumping brine to a much deeper stratum, mainly 3,900 to 4,200 ft. below the surface. The brine that is being pumped down this well is thoroughly settled before pumping. The tests have not advanced far enough to give any indication of

the success or failure.

On the Gulf Coast the cost for a 4,000-ft., completely equipped, well is \$40,000 or \$10 per ft. Such a well handles 4,000 bbl. of waste water per day. The capital investment is about \$10 per bbl. of daily capacity of water handled plus cost of the chemical treatment. For either the open or closed type of brine disposal system the operating cost does not exceed 1.5 c, per bbl. Some plants show disposal costs below this figure, while others have considerably higher overall costs per barrel of brine.

The average well disposes of about 4,000 bbl. of salt water per day, how-

ever, there are wells handling as much as 8,000 to 9,000 bbl. through a 7-in. casing and 5-in. cement-lined tubing (which means about 4-in. opening). Recently, phenolic-formaldehyde resin inside coatings have been used for piping, fittings and valves in preference to cement where brines are handled. The resin not only protects the metal from corrosion, but has the

PLANNED MAINTENANCE

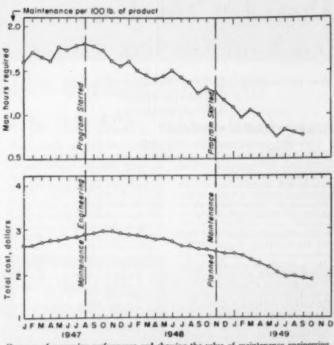
(Continued from p. 117)

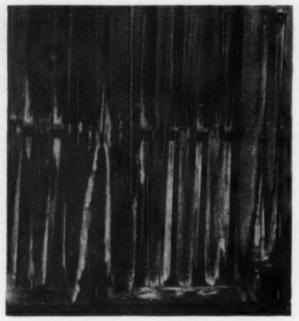
the maintenance department and the individual supervisors are turning out -as compared with six months or six weeks ago-is the next function of importance to planned maintenance. This measure of performance can be done in a variety of ways and with a wide range of yardsticks. The requirements of the individual plant will determine the measuring elements selected in most cases. However, several standards which should fit almost any plant are two continuous charts which will show maintenance man hours per 100 lb. of production, and total maintenance cost per 100 lb. of production. These standards measure the true peradvantage of a larger internal diameter than is possible with equal size pipe which is cement lined. Costs are comparable.

The author wishes to acknowledge the assistance given him in the preparation of the material covering the experience of some of the oil producers by M. E. Brock and Paul Weaver of Gulf Oil Corp.

formance of the maintenance department and show the value of maintenance engineering and planned maintenance in dollars and cents.

Our discussion has dealt almost entirely with the handling of normal work orders. Actually, planned maintenance also does many other things. It maintains an inspection schedule system which sets up regular inspections of all plant equipment; helps to plan large overhaul jobs; and helps to develop adequate routine and patrol work coverage. It cooperates with the maintenance engineer in developing improved work methods and improved process equipment and tools. Planned maintenance, in short, tackles all phases of maintenance work in an effort to systematize what has previously been done "by guess and by God."





Tower rapidly approaching ruin; note exfoliation and salt accumulation.

Don't Let This Happen **To Your Cooling Tower**

Best preventives: 1. Keep Na₂CO₅ content low

2. Hold pH neutral

3. Wash down often

C. L. BLORM and H. D. FRAZIER

Fluor Corp. recently made a survey of 500 cooling towers in the Pacific Coast and Mid-Continent regions. They came up with the fact, since then backed up with laboratory investigation, that tower lumber deterioration can be largely blamed on the presence of sodium carbonate in the

What can we do about this? Probably the best thing, if possible, is to

make sure the Na,CO, content is sufficiently low. No rigid value for the optimum Na,CO₆ content can be given; the lower this concentration, of course, the less chemical action on the wood. But then there are certain localized areas in a tower where salts have accumulated due to evaporation, producing high point concentrations. The door in the picture, for instance, gets wetted once in a while; carbonate dries on and doesn't get washed off by the flow of cooling water. To eliminate danger points like this, we should periodically wash down

It was also found that, while the normal carbonate ion was injurious, the bicarbonate ion had little effect. Therefore, pH control is of importance, since the carbonate to bicarbonate ratio increases with increasing pH. At values as high as 9, practically all of the hardness is in the normal car-bonate form. If the pH of the water be kept below 7.5, sufficient carbonate will be maintained in the bicarbonate

form for satisfactory operation.

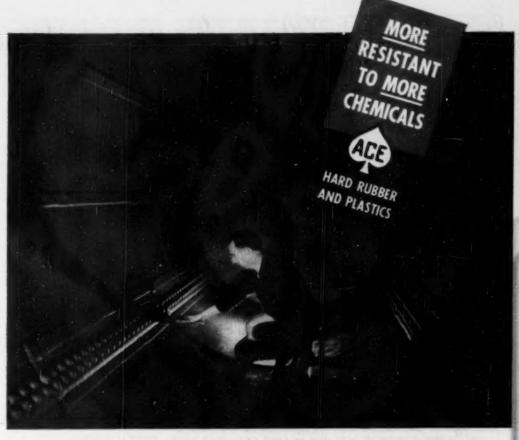
The effect of sodium carbonate solution on wood is primarily the dissolution of lignin, the principal constituent in addition to cellulose. This process of "delignification" leaves a fibrous cellular residue of low strength. Where deterioration is extreme, this residue is largely cellulose. Since this loose cellular structure will not hold nails or support other fastenings, the only repair job possible is complete replacement of the weak-ened parts. This not only brings about the expense of damage repair and replacement, but also time and money are lost by having to close down the plant.

When sodium zeolite is used to soften waters of considerable hardness, as is often done, high Na,COs concentrations may result. Along with such treatment, therefore, pH must be kept down. Care must be taken, however, that pH does not fall far below the neutral point of 7, since mechanical equipment is attacked much more by acidic than by basic solutions. As a rule, 6.5 should be considered the minimum pH for cooling water. In the range 6.5-7.5, bicarbonate concentration will be high enough to prevent attack by normal carbonate, and vet acidity will not become too

Painting has been suggested as one possible preventive measure. Aluminum paint seems to give the best protection, requiring only occasional replacement. Since salt accumulation s especially destructive to such coatings, periodic washings are required. There is one major drawback to this suggestion a coating can be applied only to non-operative sections of the tower. Any attempt to impregnate the distribution decking itself lowers the tower efficiency by altering the active evaporative surfaces. Moreover, the use of water repelling agents causes channeling of water flow, thereby decreasing the efficiency of operation.

Thus, the only sure precautionary measures are: (1) keeping Na,CO, content as low as possible; (2) holding pH between 6.5 and 7.5; and (3) washing areas over which water does not continually flow. Such planned control plus proper tower maintenance should result in increased years of operation, lower frequency of repair, and greater dollar savings for the plant

C. L. BLOHM is assistant Director of Research and H. D. FRAZIER is Senior Research Chemical Engineer of the Fluor Corp., Ltd., Los Angeles, Calif. (Note: This is a condensation for Chemical Engineering readers. The authors have available for distribution copies of the complete article.-Eprron.



SIX MILLION GALLONS OF ACID

will ride the rails - in this ACE (rubber-lined

Down inside a tank car, this ACE rubber craftsman is "checking out" a lining that will deliver and store more than six million gallons of acid without failure over many years. Note the wide, straight seams. Note how each rivet head is meticulously

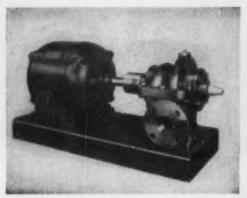
covered. Note, too, the things you can't see-the clean sand-blasted steel, the special compound of quality ACE rubber-the careful cutting, filleting, fitting and cementing-the things that make the metal-to-rubber bond so strong it can't blister or peel.

In all types of chemical equipment, ACE hard rubber linings and coverings are available to resist all alkalies, metallic salts, inorganic acids, hydrochloric acid any strength, sulphuric acid to 50 ° Bé, nitric acid to 16 ° Bé, phosphoric acid to 75%, and countless other corrosives. Other ACE plastics extend this range still further. Ask for catalogs.

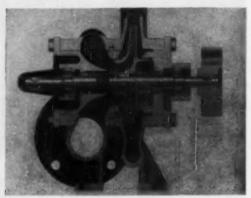


Process Equipment News

THEODORE R. OLIVE, Senior Associate Editor



Assembled De Laval Type GS centrifugal pump.



Cut-away Type GS pump showing removable rotor assembly.

New Centrifugal Pumps Designed to Simplify Maintenance and Parts Replacement

De Laval Type GS pump has all wearing parts in one assembly for replacement and service as a unit.

(142A) An unusual centrifugal pump design appears in the new De Laval Type GS pump which is built around the idea of putting all parts subject to wear into a single assembly which can readily be replaced with a new assembly. The old assembly is simply returned to the manufacturer for rebuilding, the user receiving full credit for all serviceable parts.

Centrifugal pumps wear, of course, as does any piece of machinery. Nor-mally considerable time and skill is required to tear down a conventional pump for the replacement of bearings, wearing rings or other parts. In the new pump all parts except the bare pump casing are contained in the rotor When maintenance is assembly. necessary, the top cover is removed without disturbing the piping, the rotor assembly is lifted out and a new one is dropped into place. If the user has his own well-equipped maintenance shops and prefers to do his own maintenance work, the assembly is easily transported to the shops for replacement of the worn parts with spares. If he is not so set up, however, then the company's service and exchange plan, through which he secures new rotors and gets credit for old ones, goes into operation.

Coupled with the replacement feature are design improvements which further reduce maintenance expense. Both lubrication and repacking are eliminated through the use of improved mechanical seals and prelubricated bearings which are lubricated for life.

The new pump comes in three sizes for capacities to 450 gpm. and heads to 230 ft. The casing is of cast iron and the shaft of stainless steel, eliminating the need for shaft sleeves. The impeller is bronze. An extended shaft is used to permit the pump to be operated in either clockwise or counter-clockwise rotation.—De Laval Steam Turbine Co., Trenton 2, N. J.

COMBINES TREATMENTS:

Boiler Water System

(142B) Worthington has announced a new system for treating boiler feed water which combines both the hot process and the zeolite process. Development of a styrene base resinous zeolite, suitable for operation in hot treated water, has made

it possible to combine hot process treatment with zeolite softening to assure uniform hardness reduction to 0.2 ppm. without addition of excess sodium alkalinity. The temporary hurdness is removed by lime and zeolite treatment, while the zeolite removes the permanent hardness. This in effect substitutes the zeolite salt regenerant for the more expensive soda ash customarily employed for removal of permanent hardness in hot process softeners. The salt regenerant also replaces most of the expensive phosphate customarily used for removing the residual hardness from hot process treated water. Chemical savings are thus made possible. Furthermore, operation is simplified on variable waters, because of the zeolite's ability to deliver a uniform product regardless of hardness variations. This new treatment method is known as the Hot-Z system.-Water Treating Div., Worthington Pump & Machinery Corp., Dunellen, N. 1.

BASILY INSTALLED:

Polyethylene Tubing

(142C) Under the name of Agiline, American Agile Corp. is now offering an acid and alkali-proof plastic tubing constructed of molecular natural or colored polyethylene plastic. The tubing, said to be chemically inert, comes in 4 ft. lengths and in diameters ranging from 2 to 36 in. Not recommended for tempera-

tures over 150 deg. F., the joints are easily sealed if the first 5 in. of tubing after chamfering is immersed in hot water which has been heated to 200 deg. F. The cold end of the adjoining 4 ft. length can then be inserted into the heated, flexible end of the next tubular unit and this joint, when cooled to air temperature, becomes tightly sealed. The same treatment can be used in forming curves. Other connections are made by welding or

The material is light in weight, easily joined, smooth, and lower in cost per foot than other corrosionresisting materials presently available. Suitable for handling most corrosives, it is not recommended for acetic acid. chlorine, iodine, gasoline, animal and vegetable oils and a number of organic solvents. - American Agile Corp., Plastics Div., 5806 Hough Ave., Cleve-

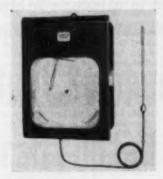
land 3, Ohio.



GIVES POSITIVE SHUT-OFF: **Triple-Seal Valve**

To give controllable flow as well as positive shut-off on fluid handling lines, Page Oil Tools, Inc., has developed a new valve which makes extensive use of rubber seals. The stem is parabolic in shape and incorporates a pre-determined fixed orifice which gives a smooth, even increase in flow as the handle is actuated to open the valve. The valve closes with a positive shut-off when the handle is released. A triple sealresponsive to hydraulic pressure prevents leakage inside and outside the seat and around the ball. A third seal prevents leakage around the stem. Design is such that added pressure on the stem seal exists when fluid is flowing. Among other features, the bracket which holds the handle swivels with the handle when the plug is loosened so that any desired handle position can be obtained. The handle and bracket are drilled and tapped so that a fusible link can be used to

hold the valve in a cocked open position if it is desired to use the valve for automatic shut-off in case of fire. -Page Oil Tools, Inc., 3356 Lime Ave., Long Beach 7, Calif.



DIRECT OR REVERSE ACTING: Recorder-Controller

Johnson Service Co. has introduced a new recorder-controller for temperature, designed to operate either direct- or reverse-acting. The controller is of the proportional action type with 100 percent adjustment of the throttling range. The Record-O-Stat, as it is called, is also available with an automatic reset feature, if desired. The instrument uses a liquidfilled, low-pressure measuring system said to give increased sensitivity through employment of a thin-walled bulb. Standard 12-in. charts are available for the temperature range from 0 to 250 deg. F. but suitable elements and charts can be provided for other ranges between 125 and 400 deg. F. Capillary tubing up to 200 ft. in length can be provided.—Johnson Service Co., 507 East Michigan St., Milwaukee 2, Wis.

CONTROLS PUMPS:

Pressure-Flow Controller

Known as the Pressureflo, a new controller for pumping systems has been announced by Builders-Providence, Inc. This device, developed from an original invention of Marsden C. Smith, chief engineer of the Department of Public Utilities of Richmond, Va., consists of a flowdetermining means, a pressure or level sensing device and a mechanism for translating these indications into a control function. Thus the equipment converts flow and pressure into pump response. The controller may be used to start and stop pumps, increase or decrease the speed of one or more pumps, maintain a predeter-(Continued)

More Information . .

To learn more about any item described here, circle the item's number on the Reader Service Postcard inside the front cover.

This Month . .

When this issue reaches you we'll already have returned from the Chicago Chem Show and our story for the October issue on what we found there will be on its way to the printer. In atepping up our return to military power we are all going to have to re-appraise the efficiency of our processes. Contact between process men and equipment men is one of the most fruitful roads to such a re-appraisal, which makes the Show an especially timely event. So, if we don't see you there, we'll be seeing you in print along about October 20. Meanwhile, here are a few new ones: e.g., that new "cubic" graphite heat exchanger on page 144. Or the Bird-Gibbs unit on page 146 which we think you'll agree can go a long way beyond the paper industry. For heating or cooling of process lines there's a novel idea on page 148, while another new scheme in heating coils appears on page 151.

Next Month . . .

In addition to the Chicago Show report, next month will bring you the usual quota of unusual equip-ment. For instance, there will be a new solvent recovery system for lower cost operation; a new idea in check valves; new instruments including a more sensitive oxygen analyzer; and several new conveyors.

Marshall and Stevens Indexes of Comparative Equipment Costs

(1924 == 100)

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens evaluation engineers, Chicago and Stevens evaluation engineers, Chicago and seven the sight process and four related inclustries listed here are assected. Published each mouth with the latest available revision. For a description of the method of obtaining the index numbers sees R. W. Stevens, Chemical Engineering, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 asee Chemical Engineering,

windstrate and the tea	mer Bor w.	0.01	
Industry	June 1949	Mar. 1950	June 1950
Average of all	160.6	160.0	168.1
Cement mfg. Chemical Clay products Glass mfr. Paint mfr. Paper mfr. Petroleum ind. Rubber ind. Process ind. asg.	155.9 163.9 150.9 154.0 167.2 167.5 160.3 162.7 161.4	165.5 163.5 150.5 153.6 156.8 157.1 169.9 162.3 160.9	158.1 166.1 156.2 156.2 159.7 162.5 164.9 163.5
Related Industries			
Elec power equip Mining, milling Refrigerating Steam power	145.5 164.6 174.8 152.0		

NEW EQUIPMENT, cont. . .

mined pressure at any point in the system, or automatically adjust both flow and pressure to suit varying demands. The method is suitable for handling either liquids or gases and applicable to any distribution system.

—Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.



WIDE-RANGE USE:
Adjustable Agitator

Under the designation of Model 7VT, Cowles Co. has announced a new dissolver for batches from 5 to 100 gal. of material ranging in viscosity up to 30,000 cp. The unit consists of a base, motor, a bridge support, and an agitator and shaft. It may be adjusted in height through a range of 11 in. and is counterbalanced by compression springs to aid in tilting the bridge support back through an angle of 60 deg, for quick removal of the impeller from the tank. The 5-hp. explosion-proof motor is mounted on the bridge. The drive assembly is mounted on a slide plate to permit horizontal movement, thus affording a wide selection of sheave ratios and speeds. Sparkproof V-belts are used to connect the motor to the impeller shaft. A variety of specially designed stainless steel impellers is available for unusual jobs. Intended primarily for production use, the unit is also small enough for laboratory and pilot plant use. - The Cowles Co., Cayuga, N. Y.

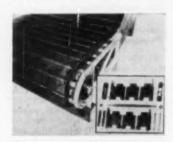
CUBIC BESIGN:

Graphite Heat Exchanger

(144B) As a manufacturer of carbon and graphite products under the name of Delanium, Powell Duffryn Carbon Products, Ltd., has recently developed a new carbon heat exchanger of unusual cubic design. It is suitable for use with practically all chemicals except highly oxidizing

acids. The exchanger consists essentially of a block of graphitic carbon said to be considerably less brittle than ordinary forms of carbon heretofore available. This block is drilled with a large number of parallel holes arranged in rows, each row of holes running at right angles to those above and below. The liquid or gas to be heated or cooled is led into and out of the block by means of headers bolted to opposite faces of the cube. By suitable arrangement of the inlet and outlet connections and partitioning of the headers, single-, double-, three- or four-pass systems can be obtained. Similarly, the heating or cooling medium is led in and out of the block with cast-iron headers bolted to the opposite faces. However, where it is necessary to carry out heat exchange between two corrosive media, carbon headers are provided also on the sides for the second medium.

This arrangement is said to give a close approximation of true countercurrent flow in a multi-pass exchanger, while, at the same time, the number of passes of the two fluids through the exchanger may be adjusted to suit the quantities of fluids handled. The carbon used has a high thermal conductivity, about three times that of stainless steel, and the construction employed is said to give great strength, suitable for operation at steam pressures up to 50 psi. The exchanger occupies about & the floor space and the volume of equivalent tube bundle types. Three sizes are available, for 10, 25 and 50 sq. ft. of heat transfer area, the largest employing a carbon block 15 in. on a side. - Powell Duffryn Carbon Products Ltd., Springfield Road, Hayes, Middlesex, England.



HANDLES HOT MATERIALS:

Hinged Steel Conveyor

(144C) A new development of May-Fran Engineering, Inc., is a hinged steel conveyor belt developed to facilitate handling of hot or highly abrasive materials. An important feature is the ease with which this belt

can be assembled into almost any required length or width from standard component parts. The links are made of heavy gage steel plate and are fastened together by means of high carbon steel rods, so that the side chains become an integral part of the conveyor belting. This construction will be evident from the detailed parts shown in the accompanying illustration. This belting utilizes individual steel links in pitch sizes of 21, 4, 6 and 12 in. which can be assembled to form belting of almost any length and in widths from 6 in. to 6 ft. to meet individual requirements. Links can be either perforated for drainage or passage of coolants, or they can be solid. Loads up to 300 lb. per lineal foot are readily handled.—May-Fran Engineering, Inc., 1681 Clarkstone Rd., Cleveland 12, Ohio.



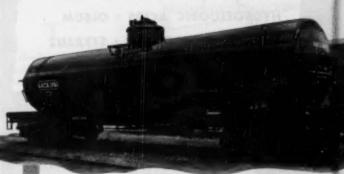
Sparger Nozzle

Two major advantages, (144D) including increased life and better heating and circulation, are claimed for a new sparger nozzle offered by Schutte and Koerting. If the sparger consists only of a pipe with holes drilled in it, the drilled holes tend to wear rapidly due to high steam veloci-ties and corrosion. This wear frequently necessitates replacement of the pipe at considerable expense. The new nozzle, which is threaded into the pipe, is said to avert such erosion, while at the same time each nozzle in effect operates as a jet heater, entraining tank liquid through the open area at each side of the nozzle. The steam and tank liquid then enter the nozzle chamber where they are thoroughly mixed and discharged, with sufficient force to cause constant agitation within the tank, thus contributing to faster heating, even temperature and quiet operation. With 183 lb. of steam per hr. at 40 psig., one nozzle in a 100-gal, tank is said to circulate 20 gpm. of water and raise the temperature of the tank liquid (Continued)

Once 7000 gallons was the standard capacity of a Sulphuric Acid tank car...

today GATX-Built Sulphuric Acid cars General American now makes it possible to ship up to 11,800 gallons of sulphuric acid in a single carry up to 11,800 gallons!

General American now makes it possible to ship up to 11,800 gallons of sulphuric acid in a single tank car. These cars are a result of the GATX program of continuous research and development for the chemical industries, through which GATX makes similar shipping economies possible for your other commodities also. More than 200 types of specialized GATX tank cars supply safe, low-cost transportation for shipments of bulk liquids.





This modern 11,800-gallon GATX sulphuric acid car is one of the largest now in service.

Shipments of smaller quantities of sulphuric ocid are made economically in 7000-gallon GATX cars.



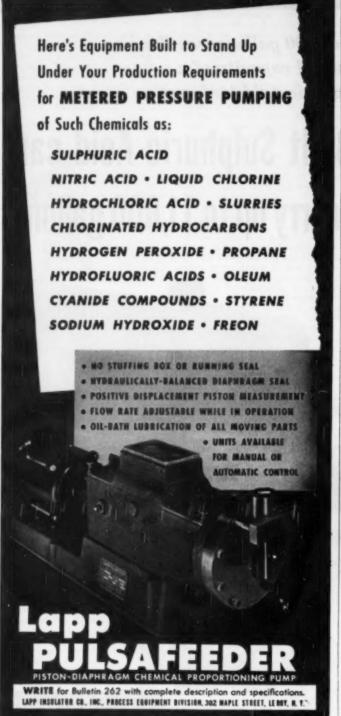
GENERAL AMERICAN TRANSPORTATION CORP.

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Specially designed dome fittings provide safe, speedy loading and unloading of sulphuric acid.

Bulk shipping keeps pace with chemical progress



New Equipment, cont. . .

40 deg. in 11 min.—Schutte & Koerting Co., Jet Dept., 12th and Thompson Sts., Philadelphia 22, Ps.



Whitewater Clarifier

(146A) Bird Machine Co. has announced availability of the Bird-Gibbs Clarifiner, an adaptation of the Gibbs Unit developed for a variety of waste recovery problems by F. S. Gibbs, Inc., of Boston. The Bird-Gibbs machine has the specific functions of recovering close to 100 percent of the fiber and fillers in paper mill whitewater, clarifying the combined waste waters from the mill, or clarifying waste water from de-inking operations and delivering the waste solids in concentrated form for ready disposal. In any event, the clarifier is claimed also to deliver a virtually crystal-clear water for recirculation to the process.

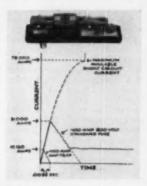
The device operates on the principal of air-bubble flotation of the solids which collect on the surface. They are agglomerated by a skimmer



POWDERED METAL CASTER

146B) Caster wheels in sizes from 1½ to 2½ in, are now being molded of powdered metal by the Bastick Co. They are molded of mixtures of powdered metals and graphite, after which they are heat treated and immersed in oil. This method of production is said to give important improvements over cast metal, including true concentricity, greater wear resistance, lighter weight and self-fubricating qualities.—The Bastick Co., Bridgeport 2, Conn.

and discharged by gravity as they are squeegeed over a slightly inclined removal plate. This operation is shown in the view above. Clear water overflows a peripheral weir. The unit consists of a tank with peripheral adjustable weir and discharge channel, containing a slowly rotating skimmer at the liquid level. Feed enters a central riser under an inverted cone distributor after being treated continu-ously for pH control. The treated influent flows downward, countercurrent to an upward flow of innumerable air bubbles of extremely fine size. These bubbles attach themselves to and buoy the solids, carrying them to the surface. The bubbles are produced from atmospheric air, without a compressor, by inspirating air through a special mixing assembly into the suction of the pump which recirculates part of the clarified water output back into the unit. This saturated water is then distributed throughout the area of downward flow of waste water in the unit.-Bird Machine Co., South Walpole, Mass.



QUICKER ACTING:

Current Limitor

(147A)High current interrupting capacity, combined with extremely fast action, is claimed for the new Amp-trap, a current-limiting device for protecting electrical installations against short circuit damage which is being marketed by the Chase-Shawmut Co. The device employs a composite linkage of certain elements including silver. These links are em-bedded in sand. When a short circuit current develops in the circuit, the silver link quickly melts and partially vaporizes, breaking the circuit in a matter of micro-seconds. Since the silver vapor is virtually a nonconductor and the quartz sand around the arc is quickly fused to a glass, the tendency of the current to force itself across the arc gap is quickly sup-(Continued)



1484 Second Rational Bank Bldg.



The Oliver Panel Filter is a modification of the standard Oliver Chemical Filter with these two major differences:

 The cloth is laid on the drum in small sections, being held in place by caulking strips between sections. No wire winding is used.

Cake is discharged by a floating adjustable discharger.The absence of wire winding permits handling and discharge-

The absence of wire winding permits handling and discharging very thin cakes which takes care of the two operating requirements mentioned above (2 and 3).

If you are filtering a valuable product on a plate and frame press or other type of pressure filter because you feel you need pressure and aren't getting a satisfactory rate because of the characteristics of the solids, investigate this Oliver Panel Filter. It could be just what you need.

> (NOTE: If solids can be discarded, it is possible that the Oliver Precoat Filter might be even a better filter for your requirements. Our laboratory or pilot unit tests would give the answer.)



OLIVER UNITED FILTERS

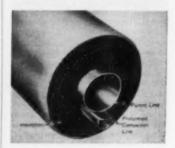
New York —33 West 42nd Street Chicago — 221 N, La Salle Street Oakland —2900 Glascock Street San Francisco —260 Calif. St.

Factories: Haxleton, Pa. • Oakland, Calif. Export Sales Office-New York

Cable—OLIUNIFILT

New Equipment, cont. . .

pressed. The accompanying illustration plots this current limiting characteristic against time, in comparison with an ordinary fuse for similar service.—The Chase-Shawmut Co., 374 Merrimac St., Newburyport, Mass.



IMPROVED HEAT TRANSFER: Steam-Traced Pipe

(148A) Known as Condo-O-Therm, a new system of pre-fabricated, insulated companion piping is being offered by the company of the same name. The main pipe, centered in the insulation, is in extensive contact with a preformed, extruded companion line, provided for heating or cooling the contents of the main line. Compared with ordinary steam tracing, with a small cylindrical pipe, the new method is said to give far greater contact and heat transfer which can be precalculated accurately. Furthermore, the insulation is said to be more economical and effective. Either heating or cooling of the main line can be accomplished, using steam, hot water, brine, ammonia, Freon or any other heating or cooling mediums. Companion lines can be preformed from tubing of copper, Monel, stainless steel or any metal required for the process. Furthermore, they can be furnished in multiples, so that the main line can, if necessary, be completely surrounded to maintain extremely high or low temperatures. The main line can be of welded, sweated or flanged construction, while one end of each length of the companion line has a special extruded neck to provide a slip fit over the end of the next length, making it possible to silver solder or braze the joints in assembly.-Cond-O-Therm, 18 Littleton Ave., Newark, N. 1.

MIGH Pressure Valves

(148B) For high-pressure service in the range from ½ to 2 in. in size, the Wm. Powell Co. is effering (Continued)



1660—Man worked hard for his pay in these days. Crude machines like this began to lighten his load by replacing laborious handwork with foot power. But progress was really only beginning.



2 1878—By accident, it was discovered that if two direct current dynamos were connected together, one would serve as a generator and drive the other as a motor. Electrical horsepower was here!



1900—Result: Electrical horsepower replaced foot power! By 1818, Howell "Red Band" Electric Motors arrived. Soon, these rugged, industrial type motors were widely accepted in many industries.

NOW...A PUNCH PRESS WITH A PUNCH!



Today—Electrical horsepower does the work! For example, this huge, modern, heavy-duty punch press, powered by a 75 H.P. Howell Motor, can exert a pressure of over 800 tons! Backbreaking labor is gone, costs are cut, time is saved and output increased!

That Howell Motors were selected for this and other important jobs in industry is a tribute to the quality and performance of Howell products.

It shows that Howell's firsthand experience in the design, manufacture and application of precision-built industrial type motors can prove invaluable to you. Consult Howell before you buy electric motors!

Equipment courtesy E. W. Bliss Co., Toledo

Free enterprise encourages mass production, supplies more jobs-provides more goods for more people at less cost.



Howell Type F Punch Press Motor

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH Precision-built Industrial Motors Since 1915





Outstanding among its great variety of mineral resources readily available for chemical manufacturing is Oklahoma's tremendous reserve of high grade silica, in several forms:

Glass Sand. Equal in chemical quality to any in the United States and used by glass plants in Oklahoma and adjacent states since 1913.

Tripoli. This state has long been an important supplier of tripoli, in 1944 ranking third in national production.

Novaculite. Outcroppings of more than 100 square miles in southeastern Oklahoma are a continuation of the outcrops in southwestern

Arkansas where novaculite has been produced for many years and where chemical analysis shows silica content to be 99% or more.

Vein Quartz. Very large deposits of milky variety are easily accessible.

Chat and Slimes. Millions of tons of highly silicious material are available as by-products of zinc mining in northeastern Oklahoma.

Detailed information on Oklahoma's mineral resources is available on request, based on data by the Oklahoma Geological Survey. Map showing lecation of mineral deposits is also available.



TYPICAL ANALYSIS OF SILICA

GLASS SAND FROM

ARBUCKLE MOUNTAINS

Average of Plant Run - 1947

99.829

0.036

0.072

0.009

0.005

0.072

100.023

SIO,

Fe. O.

CaO

A1,01 -

LOL



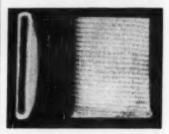
NEW EQUIPMENT, cont. . .

a new line of cast steel valves of the integral bonnet type, in globe, angle and Y types, for 1,500 and 2,500 psi. service. An important feature is the new one-piece construction of body and bonnet which eliminates the body-bonnet joint and all possibility of leakage at that point. The valve has an extremely deep packing chamber, a long guide for the disk which centers it in the seat and prevents chattering in throttling service, and is designed for easy dismantling.—The Wm. Powell Co., 2503 Spring Grove Ave., Cincinnati 22, Ohio.



cives quick steaming:
Portable Steam Generator

(150A) Development of 200 psi. steam working pressure within 2 min. from a cold start, and the production of over 3,500 lb. of steam per hr. at 75-300 psi. steam pressure, are the accomplishments of a new portable vapor steam generator now offered to industry by Vapor Heating Corp. The

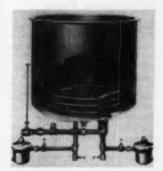


MORE HOSE, LESS SPACE

(150B) Known as Blazeguard, a new fire hose said to be flatter-folding has been introduced by Approved Equipment Mfg. Co. This rubber-lined, cotton-jacketed fire hose is designed to occupy about 30 percent less space on wall or truck rack than old-time fire hose, yet gives an actual increase in tensile strength and durability.—Approved Equipment Mfg. Co., 330 Main St., New Milford, N. J.

design is a development of many years in supplying portable generators for use on diesel locomotives. The boiler has no reservoir of water heated under pressure, but accomplishes heat transfer from its fuel oil fire by means of a 575-ft steel coil. The generator is equipped also with an economizer coil in the path of the exhaust gases and is provided with full automatic controls which make steam only when steam is needed. Once started, the controls take over causing the machine to turn off when the predetermined steam pressure is reached, turning on again when the steam pressure drops to 15 lb.

A single 5 hp. electric motor or gas engine supplies power to drive the water pump, blower, ignition and fuel pump. Accessories include high steam-temperature limit control, high and low fuel and water pressure cutouts, an electric eye cut-out, safety valves, and efficient atomization. Overall dimensions including the steam reservoir are 8 x 4 x 64 ft. high. Smaller units for 300 lb. per hr. as well as larger units for 1,500 lb. at working pressures up to 600 psi. are also available. — Vapor Heating Corp., 80 East Jackson Blvd., Chicago 4, Ill.



Heating Coll

(151A) Known as the Kook-More-Koil, a new heating coil developed by Langsenkamp is said to have 20 percent greater heating capacity than ordinary spiral coils for heating kettles and tanks. These coils are fabricated of copper, nickel or stainless steel, but can be obtained in any desired metal for pressures up to 150 psi. Units are constructed three complete turns high, each turn of coil having an individual steam feed and separate condensate return. New steam does not have to force condensate through a series of coils. Hence it circulates rapidly through each of the three coils from the inlet (Continued)

One call is all—when you buy Pyrene

Buy fire extinguishers the reliable, prompt, economical, easy way—from your local Pyrene jobber.

When you standardize on Pyrene, available in various types and sizes, you can depend on one source of supply for all your buying. You get immediate delivery, and you pay no freight charges. You work with one purchase order, one invoice. And you deal with an established business organization right in your own community.

Every PYRENE product, from small hand extinguisher to large complete automatic fire-fighting system, is precision-made for sure protection. Depend on PYRENE—the standard of protection since 1907—for all your fire extinguisher needs. Write for address of your local PYRENE jobber.



PYRENE for every fire hazard



"T.M. Box. U.S. Pat. Off



CARTRIDGE-OPERATED Eliminotes cannot recharging. For fires in wood, paper, teatiles, otc. Shoots water or onlineace solution. 2½ god, size. Also 2½ god, and 5 gol, count tooks.



SOBA-ACID
Standard protection for ordinory combustibles. Shoots a steedy 40 ft. dream, 2½ gal. size. For offices, factories, stores. Also in 40 gal, wheeled write.



CHEMICAL FOAM
2½ get, size produces about
22 get, of fest-acting feem,
Ideal for feemmable liquid and
ordinary combustible hezerds.
Also in 10 get, and 40 get,
inharized units.



VAPORIZING LIQUID
The all-purpose entinguisher effective on almost every kind of fire. Sofe on electrical fires, tool 1 as, and 1½ at, pump types; 2 at, and 1 gal, pressure-operated types.



MANUAL AND AUTOMATIC SYSTEMS Complote fire-fighting systems, using chemical foom or air foom. Also Pyrane air foom pinryripes.

PYRENE MANUFACTURING COMPANY

593 Belmont Avenue

Newark 8, N. J.

Affiliated with C-O-Two Fire Equipment Co.

A MIDWEST CHEMICAL CO.

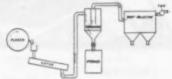
saves 4112,500 annually

salvages

Two complete Dustube Dust Control systems are used to aliminate dust nuisances in this midwest chemical plant*. In one system about 25,000 lbs. of very fine metarial is handled daily. From 5% to 7% at this eccapes preliminary separators and is trapped in a Dustube. Worth 15¢ a pound, a minimum of \$187.50 is saved each day.



In the second system which ventilates chemical processing stations, a minimum of 750 pounds of valuable material is recovered each day with a Dustube. At 25c per pound, the product recovered daily has a value of \$187.50.



DUSTUBE DUST CONTROL

The two Dustube Collectors installed at this chemical company have paid for themselves many times over with their thorough dust removal. Dustube's highly effective filtering action traps even the finest dust with virtually 100% efficiency. Its simple, practical design provides the highest efficiency at the lowest cost.

Let Dustube engineers show you why users everywhere say: "It pays to own a Dustube." Write today for full information.

6 Name on request



American
WHEELABRATOR & EQUIPMENT CORP.

WHEELABRATOR & EQUIPMENT CORP.
347 S. Byrkit St., Mishawake, Indiana

dustube COLLECTORS

NEW EQUIPMENT, cont. . .

to the outlet or drain side. As shown in the illustration, the divided header houses one main steam feed line and one condensate return line.

Coils are produced of 3 in. tubing in diameters of 42 and 60 in., so that a 42 in. coil can be nested within a 60 in. coil. Such a combination, operating at 125 psig. is claimed to raise 10,000 gal. of water from 60 to 212 deg. F. in 1 hr. The same set of coils is claimed to evaporate 1,500 gal. of water per hour under similar conditions. Individual traps, proportioned to the coil sizes, are furnished with the coils.—F. H. Langsenkamp Co., 227 East South St., Indianapolis, Ind.



SIMPLIFIED DESIGN:

Self-Priming Pump

(152A) Made in sizes from 4 to 5 hp., with open or closed impellers and capacities and heads to 120 gpm. and 135 ft. respectively, a new, simplified self-priming centrifugal pump is being offered by Goulds. In the new pump all valves are eliminated. The pump is said to be positive in its self-priming, to employ no large and bulky priming reservoir, and to have no recirculation of water during the pumping stage. Efficiency is said to be comparable to that of standard centrifugal pumps. The pump is claimed to be suitable for suction lifts up to 25 ft.—Goulds Pumps, Inc., Seneca Falls, N. Y.



HARDER, TOUCHER:

Ball Mill Media

(152B) U. S. Stoneware Co. has announced the development of (Continued)

If Your Problem is to Introduce Chlorine Into Organic and Inorganic Compounds,

Consult

As inventors of the famous Hooker "S" Cell for the production of high quality Chlorine, it is natural for Hooker to specialize in the manufacture of Chlorine compounds. In addition to liquid chlorine, there are several other chlorinating agents manufactured by Hooker. For various types of organic and inorganic chlorinations you may select

the one best suited to your processing requirements. Their uniformity and high quality enable the user to prepare products of uniformly high quality without costly variations in manufacturing procedure.

In addition, the experience of Hooker's technical staff is available to you for consultation on any processing or handling problems.

THIONYL CHLORIDE . SOCI2

Since Thionyl Chloride has been commercially available in a high degree of purity, it has become of increasing importance to the synthetic organic chemical industry. It reacts with the hydroxy group usually replacing it with an atom of chlorine. It reacts with the organic acids to produce acid chlorides or anhydrides. By the use of high vacuum during distillation good results are obtained in the production of the acid chloride of stearic acid and other high molecular weight fatty acids.

Thionyl Chloride may also be used to introduce sulfur

alone or in combination with oxygen.

For technical data on Thionyl Chloride, write on your company letterhead for Hooker Data Sheet No. 716.

Molecular Wt	
	Pale yellow to red liquid
Freezing Pt	
Boiling Range	Technical grade 72° to 79°C
	Refined grade 75° to 78°C
	1.640
Analysis To	echnical grade 93.0% by wt. SOCl ₂
	Refined grade 97.5% by wt. SOCl ₂

SULFURYL CHLORIDE . SO2CI2

Sulfuryl Chloride is an inorganic compound most useful in the synthesis of organic chemicals. As a chlorinating agent Sulfuryl Chloride has the advantage of reducing substantially the beat of chlorination over that of using elementary chlorine. Furthermore it is possible by using different catalysts, reacting at different temperatures and by carefully controlling proportions to chlorinate selectively.

Five types of reactions of Sulfuryl Chloride with organic compounds are of importance. (1) chlorination of aromatic compounds; (3) chlorination of aliphatic compounds; (3) sulfonation of esters, acid chlorides, anhydrides, etc.); (3) condensation and miscellaneous reactions.

tion and miscellaneous reactions.

For technical data on Sulfuryl Chloride write on you company letterhead for Hooker Data Sheet No. 717.

Molecular 1	Wt.	4									6						ä					135
Description			2	6.61		į,	. *			*		- 10	*			1	å	ght	ye	llov	r B	quid
Freezing Pt.						,		61		í,			Ġ.			. ,			B	dow	and	и с
Boiling Ras																						
Spec. Gravit																						
Analysis	500				Э.				c	3				О	hi	er	. 9	994	by	Wt.	SO	LCL.

SULFUR CHLORIDES . Mono-S2Cl2 DI-SCI2

Sulfur Monochloride and Dichloride are as closely related that their uses should be considered together. Sulfur Monochloride is a definite chemical compound with well defined properties, but the Dichloride may be considered as the equivalent of chlorine dissolved in S_CCl₂.

The sulfur chlorides react with unsaturated hydrocarbons introducing sulfur and chlorine into the molecule. In addition there are a substantial number of reactions for which the chlorides are definitely indicated as a ready source of chlorine because of their advantages of handling, of storage and low price.

For technical data on Sulfur Dichloride, write on your company letterhead for Hooker Data Sheet No. 759. For data on Sulfur Monochloride request Data Sheet No. 760.

	Sulfur Dizhiorido SCl ₂	Sulfur Monachieride \$2Cl2
Mol. Wt	103	185
Description	Dark brown or reddish liquid	Yellow to slightly reddish liquid
Freezing Pt	-78°C	-80°C
Boiling Pt	Decomposes above 40°C	198°C
Spec. Gravity at 15.5°C	1.658	1.6005
Analysis by wt.	00% Cl ₂	52 to 52.5% Cla

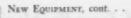
For more detailed information write us on your firm letterhead, We will send you Technical Bulletin 328A "Chlorinating Agents," which describe these and other Hooker chemicals for chlorinating.

From the Salt of the Earth

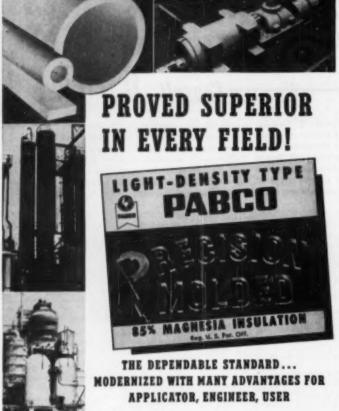
HOOKER ELECTROCHEMICAL COMPANY

5 PORTY-SEVENTH ST., NIAGARA FALLS, N. Y. . WILMINGTON, CALIF. . TACOMA, WASH. NEW YORK, N. Y.





Borundum, a new non-metallic ball mill grinding medium which is hard, heavy and tough, resembling synthetic sapphire in composition. The new media weigh 70-80 percent more and are up to 50 percent harder than conventional media such as porcelain balls or flint pebbles. The unusual tubular shape is said to provide greater contact area. The relatively smaller size (13/16 in. O.D. by 13/16 in. long) has been found after lengthy tests to be most effective for both large and small capacity mills. The material has a dense, non-absorbent body which is white, smooth and easily washed, permitting easy interchangeability in grinding various materials without danger of inter-material contamination. In tests comparing the new media with porcelain balls, the loss in weight in 24 hr. in grinding 24-40 mesh fused silica was only about that of porcelain, whereas almost twice as much of the mill charge was reduced to pass a 100-mesh screen in 4 hr. grinding time.-The U. S. Stoneware Co., Akron, Ohio.



- 1. Lighter Weight
- 2. Lower Thermal Conductivity
- 3. Controlled Uniformity
- 4. Attractive Smooth Finish
- 5. Greater "Ductile Strength'
- 6. Cleaner
- 7. More Durable
- 8. Easier To Apply
- 9. Precision Pipe Fit
- 10. Simplified Thickness Standards

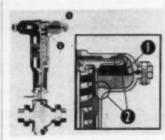
Pabco's patented process revolutionizes the natural insulation superiorities of 85% Magnesia. Specify it for your projects.

Write nearest office below for your copy of our new, comprehensive catalog and engineering reference book on heat insulation.

> THE PARAFFINE COMPANIES, INC. INSULATION DIVISION SAN FRANCISCO, 19 **HEW YORK, 16**







Diaphragm Motor Valve

(154A) Several design improve ments are incorporated in the new Flowrite diaphragm motor valve offered by Powers Regulator Co. The valve is produced in sizes from ‡ through 8 in., for diaphragm operation at pressures below 250 psi. It can be controlled by air or water pressure for regulating flow of steam, water, oil or gases. Among its features is a new molded neoprene diaphragm designed to give increased scaling action with increasing control pressure. This feature is indicated at (1) on the diagram. The piston plate assembly at (2) is closely guided to maintain the stem in accurate alignment. The easily accessible adjusting screw is of the ball bearing non-rising type for adjusting the starting pressure from zero to 17 psi. Full travel of the valve is obtainable for 5 or 10 psi, control pressure change. The

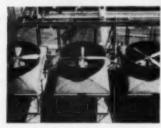
valve proper is available in a variety of types and constructions, with stainless steel and bronze trim.-Powers Regulator Co., 2720 Greenview Ave., Chicago 14, Ill.



"SLAS" FIRST FLAMES:

Fire Detector

(155A) Under the designation of FD-10, Fireye Corp. has introduced a new fire detection system which detects the first flames of a fire and does not depend on heat, smoke or other indications. It is therefore claimed to be virtually instantaneous in action. The system consists of a protection block consisting of six detectors and one control panel, providing coverage of areas up to 120x80 ft. For larger areas, combinations of protection blocks may easily be made. The device, operating on a photoelectric principle, is capable of detecting a very small fire, but is said to be designed in such a way as to ignore extraneous light of any intensity, such as the sun or artificial illumination. -Fireye Corp., 77 Broadway, Cambridge 42, Mass.



FOR INDUSTRIAL COOLING:

Axial Fan

Through its Acromatic Propeller Department, Koppers Co. is offering the new Aeromaster fan for large air conditioning and water-cooling applications. The new fan, produced in diameters from 6 to 20 ft., is said to save up to 10 percent in (Continued)

FURFURAL FACTS, NO. 1 OF A SIMPLE



Furfural Facts For Management

One of these days you are likely to be asked to O.K. a project involving furfural use research or an actual commercial application. This chemical is steadily expanding into new fields and many concerns have already found that a study of furfural use is profitable. Here are facts about furfural to help you evaluate what it offers you.

1. TECHNICAL SUCCESS - Furfurel is a multi-purpose product. It is a reactive solvent for resins in making brake linings and abrasive wheels: a selective selvent for refining rosin, petroleum, vegetable oils, and C-4 hydrocarbons; the chemical building block for a host of useful chemicals including nylon intermediates and phenelic resins.

2. AVAILABILITY AND SUPPLY-Plentiful quantities of furfural are available on a year around basis. Furtural is made from non-food raw materials such as carn cobs. the supply of which is readily

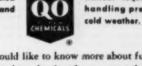
renewable and far in excess of any foreseeable demand. Furtural manufacturing plants are located at Cedar Rapids, lows and Memphis, Tennessee.

3. ECONOMY - Furfural is inexpensive and has been for a long time. For twenty years it has sold for less than ten cents per pound in tank car lats. There has been no price increase in over five years.

4. SAFETY-Over twenty-five years of commercial experience with furfural in industry has demonstrated that it can be handled safely without endangering the health of those working with it.

5. EASE OF HANDLING-The freezing point of -33°F. is so

low that furfural can be stored safely and can be used at low temperatures without requiring special handling precautions in cold weather.

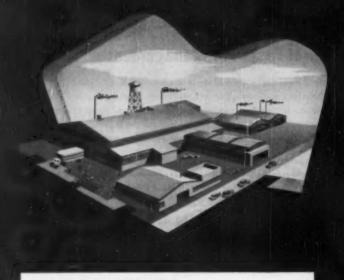


Suggestion-If you would like to know more about furfural itself and the uses which have been developed, we suggest that you ask us for copies of Bulletins 201 and 204.

The Quaker Oals Company 3358 The Merchandise Mart

Chicago 54, Illinois 19408 Whitehall Bldg., H. m Francisco, The Griffin Chemical Co. on, England + In Australia, Swift & in H. V., Rollerdom, The Notherlands

For low-cost, rapidly-built function-engineered plantscall on McCloskey



Your new plant, from the selection of the proper site to the completion of the entire project, is planned and constructed for you quickly and with economy by McCloskey. As specialists in industrial construction, McCloskey engineers plan your operation for present and future needs—recommend a custom design—provide all materials—supervise construction—give you a finished plant ready for operation.

You seve measy on construction as McCloskey has developed designs and methods through years of experience that eliminate many costly items and procedures. For example, our exclusive Rigidsteel* design makes possible increased headroom with low eaves which means less building to maintain—less space to heat.

Proved by experience to be truly economical, McCloskey buildings are in use by many of the largest corporations around the world. Month after month more companies, large and small, find McCloskey builds the best plants for the lowest investment. They demonstrate their preference by repeatedly having McCloskey take charge of their entire expansion programs.

Your plant too can be built at a big savings in time and money by McCloskey. Before you start planning any new construction, it will pay you to take advantage of this efficient service. McCloskey engineers will be glad to go over your problems with you and suggest an economical way to solve them. Write for information to McCloskey Company of Pittsburgh, 3411 Liberty Avenue, Pittsburgh 1, Pa.

"Rigidated to a tradomark of McCloskey Company of Pittaburgh

McCloskey Company

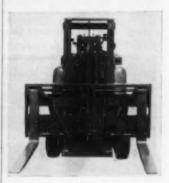
New Equipment, cont. . .

power requirements in handling capacities up to 500,000 cfm. of air. Blades of the new fan employ aerodynamic design principles, modified from aircraft practice to permit moving a large volume of air at a minimum of horsepower. The blade core is made of laminated birch, bonded with Koppers Penacolite resins. An Aeroloid plastic covering over the wood is said to assure resistance to mild acids, alkalies and atmospheric conditions. During assembly opposite blades are matched and each fan unit is prebalanced. If desired, fan pitch may be readily adjusted at the time of installation.—Aeromatic Propeller Dept., Koppers Co., Baltimore, Md.



FOR HARABOUS LOCATIONS: Special Lighting Fixtures

(156A) A new series of explosionproof lighting fixtures, as well as a series of dust-tight fixtures, has been added to its Pylet line by the Pyle-National Co. The LE series of explosion-proof fixtures for Class I,



ADJUSTABLE FORKS

(156B) To enable the operator to adjust fork widths quickly and accurately to take care of pallets or material of different widths, Townotor Corp. has developed a fork attachment for its fork trucks which is hydraulically adjustable. Since the adjustment can be made while the truck is in motion, it is claimed possible in some instances for one fork lift truck so equipped to do the work of two.—Towmotor Corp., Cleveland, Ohio.

Again COPPER is the choice!

This time for three 600 bbl. brew kettles in DUQUESNE'S new brew house

Now that its magnificent new brew house is in production, the Duquesne Brewing Company of Pittsburgh, Pa., has a chance to catch up with the demand for Duquesne Pilsener and Silver Top, "The Finest Beers in Town." Architects and engineers on this ultra-modern job were Harley, Ellington & Day, Inc., of Detroit. Anaconda Copper was the preferred metal, based on its record of performance in so many brew house applications—for so many generations. The American Brass Company, General Offices, Waterbury 20, Connecticut.

Compare Copper with any other metal for Brewing Equipment

- moderate initial cost
- low maintenance
- high corrosion resistance
- long service life
- high heat conductivity
- readily workable
- easily braze-welded
- proven performance

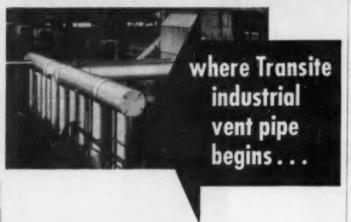
ANACONDA

OR BETTER BREW HOUSE EQUIPMENT

SCHOCK, GUSMER & CO., INC.

Three main all-copper brew kettles
Two cereal cookers with copper domes
Two mash tubs with copper domes
Three lauter tubs with copper domes
Nine 500 bbl. all-copper water tanks
with copper heating calls, atc., and
many other copper appurtenances.

Tough venting problems end ...



Yes—Transite® Industrial Vent Pipe solves many a venting problem because it resists the attack of many corrosive fumes, vapors and gases day in and day out . . . and seldom requires maintenance.

That's because Transite is a tough, durable asbestos-cement product that cannot rust or rot. It has a high degree of chemical stability which enables it to stand up for years under corrosive conditions which would destroy many other pipe materials in a much shorter



Complete line of fittings enables Transite Industrial Vent Pipe to be fitted to eny situation, changes of direction, manifold connections, etc.

time. Transite Pipe has been able to substantially reduce replacement and maintenance costs for venting systems throughout countless plants in all types of industries.

It's easy to install—because Transite Pipe is light in weight, easy to handle. It can readily be cut and drilled with ordinary tools.

And it's adaptable—for Transite Pipe comes in a range of sizes up to 36" in diameter that can be used for vents, ducts, or stacks. Furthermore, a complete line of Transite fittings permits you to make your entire venting system corrosion-resistant.

Just write to Johns-Manville, Box 290, New York 16, N. Y. for further information on Transite Industrial Vent Pipe. Ask for Data Shor, Series DS-336.

*Transite is a Johns-Manville registered trade mark

NEW EQUIPMENT, cont. . .

Groups C and D hazards, can be used in locations where highly flammable materials are manufactured and handled. The DE series of dust-tight fixtures, for Class II, Groups E, F, G and Class III hazards can be used in locations where flammable dusts are present in quantity. The first type uses flame-tight cast aluminum alloy housings to render internal explosions harmless and insure safe operating temperatures. The second type uses strong, one-piece cast aluminum alloy housings designed to exclude dust from the interior and avoid dust accumulations on the exterior surface. Both are available in many types and sizes.-The Pyle-National Co., 1334 North Kostner Ave., Chicago 51, Ill.

Eye Wash Fountain

(158A) For eye protection in chemical plants, the Haws Drinking Faucet Co. has developed an eye wash fountain with two specially designed angle stream heads, directing a double stream of clean water into the eyes at a simple twist of the control valve. Available also is a combination of the fountain with a high volume shower which delivers a sudden drenching bath to dilute and wash away chemicals before they can penetrate clothing.—Haws Drinking Faucet Co., 4th and Page Sts., Berkeley 10, Calif.

Karbate Bevelopments

(158B) National Carbon has announced a new hand threading tool for Karbate impervious graphite pipe. Easily portable, the device is said to produce clean, sharp threads. Among Karbate equipment developments is a new larger standard Type 240A heat exchanger with 71 sq. ft. of surface for tube pressures to 75 psi and steam pressures to 50 psi.—National Carbon Division, Union Carbide & Carbon Corp., 30 East 42d St., New York 17, N. Y.

High Density Welder

(158C) Lincoln Electric's new Hidensity hidden are welding process employs exceptionally high current densities by using 3/32 or 5/64 in. electrode wire at currents up to 600 amp., thus creating a penetrating are and producing high-welding speeds. Less weld metal is required and little or no edge preparation is needed. The current density is comparable to use of 10,000 amp. on a standard h incoated hand electrode. The process is carried out by connecting a manual

Typical industries in which Transite Industrial Vent Pipe is used:

Aircraft
Automobile
Buking
Blooching
Boiler Works
Browing
Conning
Coramic
Chemical

Dairy Drug Electrical Explosives Farm Machinery Food Foundry Furnace Furnature

Gus Glass Laboratory Laundry Loathor Match Meat Packing Matal Mining Paint
Patroloum
Potash
Pulp & Paper
Quarrying
Railroad
Rayon
Rafrigoration
Rubber

Soap Soft Drink Sugar Refining Textile Teol Water & Sewage

Shipbuilding

Shoe Smelting

Johns-Manville
TRANSITE Industrial PIPE

Lincolnweld ML-2 unit to an SAE 600 or 900 amp. welder. This self-contained unit consists of a control case, wire reel case, conductor cable and welding gun which is moved either manually or by mechanized carriage. Wire feed is automatic. The gun holds granular flux which is deposited around the high-density are so as to keep it covered.—Lincoln Electric Co., Cleveland I.; Ohio.

Reinforced Packing

(159A) Crane Packing is now offering its Super-Scal spiral plastic packing with a vulcanized tape back. This enables the spiral to be twisted down to small shaft sizes for cutting rings without danger of breakage. With the back clearly marked by color, the six different types of packing in this series are easily distinguished. — Crane Packing Co., 1800 Cuyler Ave., Chicago 13, III.

Roof Ventilators

(159B) To insure exhaust and dispersal of harmful fumes as high as possible in the air above the roof, the DeBothezat Fan Div. has designed a new fan-type, vertical-discharge roof ventilator made in sizes from 36 to 48 in., for capacities up to 40,900 cfm. of air. High capacity results from a straight discharge without bends in the airstream. Either direct or V-belt driven fans can be used. Automatic dampers outside assure weather-tightness under all conditions.—DeBothezat Fan Div., American Machine & Metals, Inc., East Moline, Ill.

Glass Cheek Valve

(159C) For use in its liquidlevel gages and manometers, King Engineering Corp. has developed an allglass overflow check valve to prevent loss of indicating liquid. This consists of a glass float check in a glass cylinder, with ground and lapped mating surfaces which meet when the float rises due to excessive pressure surges.—King Engineering Corp., Box 300. Ann Arbor, Mich.

Ionization Gage

(159D) Westinghouse has developed a new ionization gage for measuring high vacuum at pressures as low as 5 x 10⁻¹ microns. The three elements of filament, grid and ion collector are inverted from the usual arrangement, with the two filaments (one a spare) outside the cylindrical grid, while the fine-wire ion collector (Continued)



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and fume control problems
For 42 years, Kirk & Blum has

For 42 years, Kirk & Blum has specialized in the DESIGN, FABRI-CATION and INSTALLATION of efficient, dependable systems for the removal of dust and furnes.

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ith "inert-gas-shieled-d-arc" welding, produces piping with absolutely smooth inside walls, meeting the most exacting code requirements... Always remember that it a cheaper to take the work to the welder than to move men and equipment around on the job. For the best solution to your high-pressure, high-temperature piping problems, write us or send your prints for an estimate.



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PRILABELPHIA 46, PA.

NEW EQUIPMENT, cont. . .

is within the grid. Results are comparable to a conventional ionization gage, with the added advantage that since metal surfaces are at a minimum, outgassing of the elements is considerably simplified.—Westinghouse Lamp Division, Bloomfield, N. J.

Stainless Bellows

(160A) Chicago Metal Hose is now prepared to supply stainless steel bellows in a complete range of sizes for use in valves, instruments, control devices, flexible connections and other applications. They can be provided with standard fittings or fittings to customers' specifications, using electrical circular seam welding to assure leakproof assemblies.—Chicago Metal Hose Corp., Maywood, III.

Sight Glasses

(160B) A new line of sight glasses made of polished Pyrex plate glass, in a wide range of sizes and shapes, is being offered by Swift Lubricator Co. Suitable for peep holes and inspection windows in furnaces, columns, reaction vessels and other equipment requiring a heat resistant glass, they are suitable for all chemicals except HF and strong caustic. Thicknesses range from \(\frac{1}{2}\) to \(1\) in., circles up to \(1\)6 in. diam., and rectangles up to \(24\) x \(60\) in.—Swift Lubricator Co., Elmira, N. Y.

Mask Phone

(160C) Communication with a wearer of a gas mask is possible with a new voice-powered telephone offered as the Maskfone by Mine Safety. A set consists of a transmitter, earphones, handset and 125-ft. cable on a reel. The transmitter can be used with any of this concern's masks equipped with a Cleartone speaking diaphragm.—Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

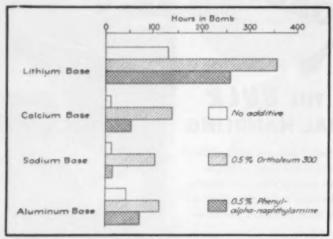
Pipe Coupling

(160D) A new Morris coupling for either plain or threaded pipe is being produced in sizes to 8 in. in standard zine-coated steel and in aluminum. The coupling employs a compression band easily drawn up with any wrench, made tight by a gasket of rubber, fiber glass, cork or neoprene. The entire surface of the joint is held in compression.—Morris Coupling & Clamp Co., Ellwood City, Pa. —End



New Products and Materials

JOSEPH A. O'CONNOR, News Editor



The longer the bar, the better the stabilizer. Above are test results on four greases (Norma-Hoffman bomb, brass catalyst, 25 pai. pressure drop).

New Grease Stabilizer's Twofold Action Retards Oxidation and Deactivates Metals

Today, operating temperatures that greases have to withstand in service are higher than ever. Hence both resistance to oxidation and thermal stability have become all important in a grease. What's more, many industrial and aircraft bearings are now life-packed sealed units; the grease for their lubrication must remain stable throughout the life of the bearing. Such bearings often have to operate continuously at elevated temperatures. Unless the grease is sufficiently stable, premature failure may occur. And today's higher speeds and heavier loads in automotive and other industrial applications mean that greases have to stand up under higher temperatures than ever.

To prevent oxidation of greases in storage and service, a small amount of antioxidant is added. Many greases can be stabilized by addition of such compounds as phenyl-alpha-naphthylamine. But sometimes, particularly in the presence of such catalytic metals as brass, it's difficult to get the desired stability.

Now comes Du Pont's Ortholeum

300, an effective grease stabilizer in both non-catalyzed and catalyzed systems. Its effectiveness in catalyzed systems is outstanding.

A mixture of complex organic amines, Ortholeum 300 provides both antioxidant and metal deactivating qualities. The brown flakes of Ortholeum 300 start melting at 125 deg. F. and are completely melted at 160 deg. F. Normal use concentrations contain 0.2 to 1.0 weight percent of the Du Pont grease stabilizer. Above 160 deg. F., Ortholeum 300 is miscible in all proportions with oils and greases; normal use concentrations are soluble at all temperatures.

Unlike many grease antioxidants, Ortholeum 300 is essentially insensitive to light. Hence this product darkens little on exposure to light.

Ortholeum 300 works two ways to stabilize grease. First, it retards normal oxidation processes; and second, it reduces the harmful catalytic effect of metals to a minimum. It accomplishes this twofold result by combining antioxidant and metal deactivating properties. This combination imparts

to greases an oxidation stability superior to that attainable through the use of antioxidants alone.

The new stabilizer has been evaluated in many types of greases. The concentration required varies in different greases but usually falls within the range 0.2 to 1.0 percent by weight.

In comparative evaluations in the laboratory, using the Norma-Hoffman oxidation bomb test, Ortholeum 300 was more effective than other current commercial products. Tests were made both with and without brass catalyst. The bar chart shows typical Norma-Hoffman bomb data on greases containing Ortholeum 300. For comparison, data on greases containing phenyl-alpha-naphthylamine are included. These tests were discontinued at the 360-hr. point as the relative effectiveness was clearly indicated. Non-catalyzed tests were not made with the aluminum-base grease as the control sample was very stable (only 14 psi. pressure drop at 360 hr.)

Ortholeum 300 can be added to the grease during the cooling period, following the last high-temperature step in the process. It may be added directly to the grease, with the grease at a temperature of 180 to 200 deg. F. to effect rapid solution. Or an oil concentrate of Ortholeum 300 can be made up and added to the grease. Concentrate temperature should be higher than 160 deg. F. to effect complete solution; however, to prevent deterioration of the stabilizer, the concentrate should not be kept above 200 deg. F. any longer than is necessary

to make the addition. Du Pont's new grease stabilizer contains an aromatic amine that is toxic. Exposure may produce symptoms somewhat similar to those caused by aniline but less severe. It can enter the body by absorption through the skin or gastro-intestinal tract, or by inhalation of vapor or dust. Food should not be stored or eaten where it is used. Because of the high temperatures at which Ortholeum 300 is used, it is important that adequate ventilation be provided. Where this is impossible, an air mask should be provided. Employees handling Or-tholeum 300 should avoid contact with skin or eyes. Skin tests on animals have not indicated any harmful effects resulting from contact with

greases containing up to 5 percent Ortholeum 300,

The new grease stabilizer comes packed in 50-gal, fiber drums containing 175 lb. net. These containers comply with ICC regulations, are non-returnable, and no separate charge is made for them, their cost being included in the selling price. All shipments are made from Du Pont's Carney's Point, N. J., plant.—E. I. du Pont de Nemours & Co., Inc., Petroleum Chemicals Division, Wilmington 98, Del.

NOW USED IN MEMCINES: Carbonyl Iron Powder

/162A1

Now that the National Formulary committee of the American Pharmaceutical Association has approved carbonyl iron powder for medical use, Antara Products Division of General Aniline & Film Corp. is beginning limited distribution of GA&F Carbonyl Iron Powder RX, a form of metallic iron of extreme purity and microscopic particle size. It will be offered to manufacturers.

GA&F Carbonyl Iron Powder is made by the reaction of carbon monoxide gas on iron ores to form liquid iron pentacarbonyl. This liquid is then vaporized and the heated vapor decomposes into iron powder in the form of microscopic spheres. By this unique method all impurities in the iron are left behind and the product is chemically pure. The spheres are preformed, never ground or split and so are completely stable, with no change in form or color.

Carbonyl iron powde: has been produced in this country since 1941 at the plants of General Aniline & Film at Grasselli, N. J., and at Huntsville, Ala. Its chief use heretofore has been in the manufacture of magnetic cores for the high-frequency oscillations that are essential in broadcast receivers, television sets, FM devices and car-

rier telephony.

Extended tests at the Industrial Toxicology Laboratories of Philadelphia, in which animals were fed as much as 5 percent of this iron in their diet for periods of 60 days, showed no hamful results even in such large amounts. The test animals compared favorably with those that received no iron. And the Carbonyl Iron Powder proved to be superior in many respects to the former standard iron reduced by hydrogen. Approval for inclusion in the forthcoming National

Formulary IX followed.

The human body needs iron to form the hemoglobin of the red blood cells, which owe their red color to iron.

Chronic blood loss and deficiency of iron in the diet lead to the commonest form of anemia, called microcytic hypochromic anemia. The basis of its treatment is the feeding of reduced or ferrous iron. Since large doses are required, the iron must be in purest form.

In the enrichment of bread and other foods, reduced iron is commonly added, along with the vitamins, thiamin, niacin and riboflavin. Iron is also a standard ingredient in pills that combine minerals with vitamins.—General Aniline & Film Corp., Antara Products Division, 444 Madison Ave., New York 22, N. Y.

IMPROVES SYNTHETIC BURGES:

Tackifler

(163B)

Through the cooperation of the United States Office of Rubber Reserve with General Aniline & Film Corp., American tire makers will now be able to use koresin to improve the tackiness of synthetic rubber. This is the compound featured in the 1945 Summary Report of Rubber Reserve on the production and performance of German synthetic tires. It was used by the Germans during the war, not only to conserve natural rubber, but because a koresin wash was found to be superior to crude rubber cement in improving the tack.

Koresin, now being produced in this country by General Aniline & Film Corp., is a condensation product of ptertiary butylphenol with acetylene, in the form of brownish lumps. It is identical with the German product and is equally effective in its tackifying action. Sufficient building tack is produced in milled stock by the use of 5 to 10 percent of koresin, based on the rubber hydrocarbon. In a gasoline solution for coating the surface of rubber stocks, the optimum concentration is from 3 to 4 percent. Koresin is not primarily a softener, but is used in addition to the softener or as a partial replacement. In addition to its use as a tackifier for GR-S rubber stocks and GR-S rubber cements, it has possibilities as a lacquer and varnish resin and as an intermediate for surfactants and tanning agents.

According to data supplied by Antara Products, and measured on a newly devised tack tester, the tackiness increased from 6 to 15 oz. on a sample of GR-S painted with a 4 percent solution of koresin and from 12 to 27 oz. in a sample of GR-S milled cold with 10 percent koresin. With only 3 percent koresin, the tack measured 21 oz.

During the war koresin was itself

More Information . .

To find out more about any of these new products, circle the item's number on Reader Service Postcard inside the front cover.

This Month . . .

Big achievement in the adrenal steroid field, reported on p. 167, is the successful synthesis of two active compounds each with a hydroxyl group in the 11-position on the nucleus. . More effective on a cost basis than other aryl sulphonate agents, the new benzeue derivative described on p. 168 increases water solubility of aniline, cresol and benzaldehyde . . On p. 170 you'll learn about a new fast drying alkyd, compatible with oils, that removes the aftertack of dehydrated castor oil.

Next Month . . .

Be on the lookout for news of a brand new chlorinating and oxidizing agent that's specific and selective in its action . . Also watch for information about an unusually stable organic peroxide.

scarce in Germany, but the tire makers considered it essential in such uses as tread cement and in ply freshening solution. They did not permit the use of crude rubber cement for these purposes. According to the Rubber Reserve report, the use of koresin in carcass stock apparently made possible the building of tires without a postcalender dip. In the cementing of plies the Germans used a Buna stock containing about 10 percent koresin as a basis for the cement.-General Aniline & Film Corp., Antara Products Division, 444 Madison Ave., New York 22, N. Y.

Colloidal Graphite

(163C)

Effective lubrication of conveyor chains that pass through vapor degreasers cannot be accomplished with ordinary petroleum products. If such are used, they are removed with all oils and greases in the passage of the chains through the degreaser tank.

(Continued)



MEDRME. PLEPHONE

New PRODUCTS, cont. . .

The more petroleum lubricant applied to the chains, the harder the degreaser has to work to remove it. This contaminates the degreaser solvent faster.

There is one high-temperature lubricant that is successful in this application because of its chemical inertness. It is colloidal graphite, a microscopically fine substance that lubricates effectively from below 0 deg. F. to above 3,000 deg. F. Because of its extreme chemical inertness it is unaffected by degreaser solvents, and hence suitable

for this use.

One manufacturer of colloidal graphite, Acheson Colloids Corp., recommends that colloidal graphite dispersed in alcohol be used on degreaser chains. The alcohol acts as a medium to transport the graphite to the points requiring lubrication. It is usually applied immediately after the chain leaves the degreaser tank and while it is still warm. By the time the chain completes its cycle and returns to the tank the alcohol has evaporated and the dry lubricating film is in position to carry the load.—Acheson Colloids Corp., Port Huroa, Mich.

FLAMBRETARDANT:

Insulating Plastic

(164A)

Rulan, Du Pont's new plastic for electrical insulation, does not support combustion. Until now, flammability has been a disadvantage of many plastics with good electrical properties. Now, however, Du Pont's Polychemicals Department has come up with this new flame-retardant plastic, which is being offered to the wire and cable and electrical industries. Rulan does not burn after the flame has been removed; neither does it drip when molten, a further advantage since hot plastic drippings can start other fires.

plastic drippings can start other fires.

Its electrical properties compare with those of polythene. However, it is not the equivalent in electrical properties of polythene, which is one of the best high-frequency electrical insulating materials known.

Rulan has a power factor, over a wide range of frequencies, of 0.002, as compared with 0.002 for polythene. Its dielectric constant of 2.7 compares with that of less than 2.5 for polythene. The new plastic insulation is non-tracking and retains its electrical properties after immersion in water for long periods at elevated temperatures. Its low-temperature properties are outstanding and its mechanical properties good.

So far, it's been hard to get Rulan (Continued)

nitroparaffins Production Up!

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- Nitroesters esterification of nitrohydroxy compounds made from NP's and aldehydes.
- 2. Nitro-clofins—treatment of nitroesters with sodium carbonate (see above) or condensing primary NP's with aromatic oldehydes.
- 3. Nitroamines from NP's, formoldehyde, and amines by Mannich reaction.
- 4. Diamines—(a) reduction of nitroamines (see above), and (b) reduction of dinitroparaffins made by condensing nitroparaffins with tetones, or reacting distorparaffins with askali solt of an NP.
- Cyclic Nitroalcohols condensing primary nitroparaffins with cyclohexanone.

- Alkyi Hydroxylamines formed by mild reduction of primary nitroparaffins.
- 7. Heterocyclic Nitrohydroxy Derivatives—prepared by condensing heterocyclic aldehydes with an NP.
- 8. Beta-Dieximes condensing three molecules of an NP in presence of a weak base.
- Trialkyl isexezeles hydrolysis of Beta-Dioximes (see above).
- 10. N-Alkyl Hydroxylamines —mild reduction of primary NP's.
- 11. Alkylidene Succinic Esters—condensing NP's with alpho beta unsaturated acid esters.

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HEAT SENSITIZERS FOR LATICES

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Methanol • Amines • Nitroparaffins • Crystalline Riboflavin



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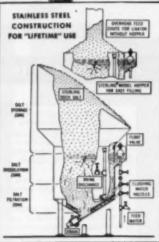
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You can eliminate shoveling, hauling, and laborious hand stirring of salt and water, and frequent testing of the brine strength—with International's Lixate Process for Making Brine. Stops waste through spilling. Saves time and labor. Assures accurate salt measurement... no guesswork.

• In the production of chemicals, leather, textiles, plastics, soap, sulphonated oils, petroleum products, food products; in refrigerating equipment such as spray decks and unit coolers; in regenerating zeolite water softeners, the Lixator provides an easy way of measuring salt accurately in the form of brine. YOU SIMPLY TURN A VALVE for self-filtered, LIXATE Brine that ideally meets the most exacting chemical and bacterial standards.

Savings up to 20% and often more in the cost and handling of sait have been reported by many Lixate users.



HOW LIXATOR WORKS

In the dissolution zone—flowing through a bed of Serling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. In the filtration zone—through use of the self-filtration principle originated by interestional, the saturated brine is throughly filtered through a bed of undissolved rock sait. The rock salt itself filters the brine. Nothing else in needed.

WHAT THE LIXATOR PROVIDES

- √ Chemical and bacterial purity to meet the most exacting standards for brine.
- √ Unvarying soft content of 2.45 pounds per gollon of brine.
- √ Crystul-clear brins.
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- Inexpensive, rapid distribution of brine to points of use by pump and piping.

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INTERNATIONAL SALT COMPANY, INC . Scranton, Pa.

New Products, cont. . .

in quantity. But laboratory and field tests point to its wide use as electrical insulation where flammability is a factor, such as insulation for high-voltage hook-up, signal-control, television lead-in, radio feed-back, and flame-retardant line wires, and for neon-sign, multi-conductor control, and high-voltage street-lighting cables.

Rulan flame-retardant plastic can be extruded onto wire at high speeds. It also can be injection-molded. Molded electrical parts and extruded electrical tape are being developed for uses where flammability is a consideration.—E. I. du Pont de Nemours & Co., Inc., Polychemicals Department, Wilmington 98, Del.

FOR CLEAR TELEVISION IMAGES:

Water-Repellent Material

(166A)

General Electric Dri-Film, a waterrepellent material, can be applied to the safety glass mounted in front of the face of the cathode-ray tube of television receivers to prevent the accumulation of unwanted moisture on the safety glass. The cathode-ray tube face, of course, is the area upon which the picture to be viewed appears when the set is turned on. When atmospheric conditions are right, water vapor in the space between the tube and the safety glass condenses to form a film of moisture and thereby to produce spurious effects on the charge distribution of the cathode-ray tube screen.

GE's Dri-Film No. 9987 renders the surfaces in this area water-repellent, preventing the conditions leading to the spurious effect that produces fuzzy images on the screen. It is being used on the safety glass installed in Dumont television sets.

There are many similar applications for GE's Dri-Film, including use on parts for hearing aids, pipe organs, and fluorescent lights. Similar materials are used to prevent water films from forming upon insulators used in radar and radio, and upon airplane windshields,—General Electric Co., Chemical Department, Pittsfield, Mass.

WITHSTANDS CORROSION:

Thermosetting Plastic

(166B)

Hysol 6000, a new thermosetting plastic material used for handling corrosive chemicals and for electrical insulation, is inert to the corrosive action of practically all chemicals, including concentrated hydrochloric acid at room temperature. This new product of Houghton Laboratories, Inc., has an exceptionally high dielectric strength with an unusually high are resistance.

Available in rod, tube and sheet form in a variety of sizes, Hysol 6000 may be punched or machined to close tolerances by conventional metal working machinery. It also may be cast into special shapes and components, offering unusual adhesion to metals, glass, ceramics and other materials. Specifications on its chemical resistance and electrical properties, suggestions on how the material can be used and details on its machining characteristics can be secured from the manufacturer.-Houghton Laboratories, Inc., Olean, N. Y.

MINIMIZES DUSTING:

Molding Starch

Hazards that normally accompany molding operations in candy manufacturing processes are reported to be considerably reduced with Moulding Starch L, a new starch introduced by National Starch Products Inc.

Developed in cooperation with insurance companies, Moulding Starch L is a starch that reduces the danger of fire or explosion during molding opera-tions by minimizing dusting. There is a marked reduction in dusting tendency even when the moisture content of Moulding Starch L is reduced to 6 or 7 percent after several re-drying Further, this new starch is actually capable of rejuvenating old starch stocks that have lost their moldability. Its characteristics are virtually undisturbed by constant re-heating. The product permits cleaner plant operation, and, in addition to the added safety factor, Moulding Starch L provides unusually sharp impressions that resist crumbling and reduce scrap on crippled pieces.

As evidence of the increased acceptance for Moulding Starch L among candy makers, National cites a case where insurance premiums were actually reduced when one manufacturer standardized on this new product for his starch boards.—National Starch Products Inc., 270 Madison Ave., New York 16, N. Y.

Adrenal Steroids

Two active adrenal steroids have been successfully prepared by the Research Division of the Upjohn Co. These two compounds, corticosterone, known as compound B, and 17hydroxycorticosterone, compound F. have been supplied recently for limited clinical testing in rheumatoid arthritis and Addison's disease. However, amounts available do not allow further distribution of these substances at present.

(Continued)

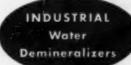


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This triple action mixer for pastes and heavy materials employs a combination rotary scraper and agitator mechanism mounted in the cover and a radially ribbed mixing disc in the bottom of the container to disintegrate, disperse and scrape the material from the sides rapidly.

Experience shows that pastes ordinarily requiring a long cycle of slow mixing can be processed with a saving of 60 to 80 per cent in normal processing time.

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NEW PRODUCTS, cont. . .

Both compounds differ from cortisone, best known of the adreno-cortical hormones, in having a hydroxyl group rather than a ketone group at the 11-position on the steroid nucleus. In addition, corticosterone lacks a hydroxyl group at the 17-position.

Introduction of the hydroxyl group at the 11-position has been considered a major chemical hurdle. Its accomplishment by the Upjohn group represents an important contribution to adrenal hormone research. — Upjohn Co., P. O. Box 271, Kalamazoo 99, Mich.

FOR AIR SAFETY:

Wax Rain Repellent

(168A)

A wax rain repellent that keeps aircraft windshields clear, preventing optical distortion, and thus increasing safety in the air, has been developed.

The new rain repellent, known as FC-10, is a paste made up of specially purified waxes. It was compounded by Dr. D. F. Stedman of the Applied Physical Chemistry Department of the National Research Council of Canada.

It is equally effective on glass or transparent plastics — on the latter, scratches are largely removed and deep scratches become less evident after treatment. Application is easy and quick, may be done indoors or out, rain or shine. Dry flights or dormant periods do not injure the film. Average useful life of one application is one month—Regal Air Corp., 418 Palisade Ave., Jersey City, N. J.

HYDROTROPIC:

Benzene Derivative

(168B)

Pennsylvania Salt Manufacturing Co. is now offering for evaluation purposes sodium parachlorobenzenesulfonate monohydrate, a free-flowing, coarsely crystalline, water-soluble compound, which has a molecular weight of 233 and is thermally stable except for loss of its water up to 300 deg. C.

Tests at Pennsalt's Whitemarsh Research Laboratories show that concentrated solutions of sodium parachlorobenzenesulfonate increase the water solubility of materials such as aniline, cresol, and benzaldehyde. Further, the hydrotropic properties of this product have been shown to be more effective on a cost basis than other commercially available agents of the aryl sulfonate type.

The sodium salt, through its action as a solubilizing agent, and the free acid, through its action as a catalyst, should be useful in promoting esteri-

(Continued)

FORMIC ACID and SODIUM FORMATE

90% and 85%)

Available in 500 lb. stainless steel drums or 125 lb. carboys. For use in:

Dyeing Operations
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Intermediates for drugs,
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A neutral and colorless crystalline powder which gives a clear solution in water and is especially suitable for use in the production of water-resistant wallpapers, in textile dyeing, in leather tanning and in a variety of other uses.

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Fig. 3169 single stage, open impeller centrifugal

7 more sizes in this new Centrifugal Line

This new and extremely successful line of centrifugals is now available in 10 sizes. You can now take advantage of the efficiency of this new design to fill your pumping needs in a wide variety of applications.

APPLICATIONS

Goulds designed the Fig. 3169 especially for general water service, irrigation, Slurries, circulation, transfer and factory wastes. It also gives excellent service in air conditioning, plumbing, heating, processing and related applications.

ADVANTAGES

The most important advantage of these pumps is their efficient, modern design. Simple construction, light weight and compact size give you reasonable price and unusually good service over a long period of time.

CAPACITIES

Fig. 3169 is made in 10 sizes for both motor and belt drives. Capacities to 1000 G.P.M. with heads to 180 ft., depending on capacity.

For more information call or write Pump Headquarters or your nearest Goulds dealer. Ask for Bulletin 720.4.





NEW PRODUCTS, cont. . .

fication, dehydration and condensation type reactions.

Laboratory investigation has indicated the following possible industrial applications for this product: (1) as a peptizing agent for casein, soya proteins and related materials in the manufacture of adhesives and plastics; (2) as an agent in pigment flushing, ore flotation, sensitizing and breaking of oil emulsions and as a solubilizing agent for certain dyes; (3) for raising the cloud points of non-ionic and anionic detergents in acid, caustic and alkaline salt solutions; and (4) for the preparation of alkaline earth salts of parachlorobenzenesulfonic acid as crank case detergents.

Tests have indicated its further applications as an adjuvant in cleaning compositions, an air entraining agent in cements, and a chemical intermedi-

Detailed information about the possible applications and physical properties of sodium parachlorobenzenesulfonate, as well as specific information about particular applications, is available from the producer.—Pennsylvania Salt Manufacturing Co., Market Research Division, 1000 Widener Building, Philadelphia 7, Pa.

COMPATIBLE WITH OILS: Alkyd Resin

(170A

A new alkyd resin is making its debut in the Chicago, Milwaukee and Philadelphia areas. It's a pentaery-thritol ester of rosin, fatty acid and maleic anhydride. General Mills Research Laboratories of Minneapolis, its producer, is introducing the varnish resin to industry with a city by city field evaluation and a test market campaign. Next area on the schedule may be Detroit.

Developed by W. A. Jordan, M. H. Herban and David E. Terry, Modiphat 345 is a fast-drying, oil-soluble alkyd resin made with fatty acid mixtures containing substantial amounts of conjugated linoleic acid. When heated slightly, it disperses rapidly in oil, producing rapid-dry varnishes that yield hard, tough films with good color and resistance to water and alkali.

The new resin is compatible with dehydrated castor oil, linseed and tung oils, and effectively removes the aftertack of dehydrated castor oils with which it is used. It is also compatible with the phenolics, modified phenolics and rosin esters.

Modiphat 345 is soluble in ethyl acetate, benzene, toluene, xvlene and mineral spirits at 20 deg. C. and at boiling temperature. Under these

same conditions, it is insoluble in ethyl alcohol.

M. H. Baker of General Mills' new products commercial research department, says that samples of Modiphat 345 are available to interested firms in the test market areas. Single drum quantities for large-scale evaluation are also being offered.—General Mills Research Laboratories, 2010 East Hennepin Ave., Minneapolis 13, Minn.

NON-SLUBGING:

Etching Compound

Pennsalt AE-18, a new, highly concentrated alkaline compound for etching aluminum without forming hard sludge deposits on the bottom of the etching tanks is now being offered by the Special Chemicals Department of the Pennsylvania Salt Manufacturing Co.

The new etching compound is the result of considerable research at Pennsalt's Whitemarsh Research Laboratories to develop a product that would give a bath of long life, assure uniform etching, and at the same time avoid the rock-like sludge deposits. Research work was followed by extensive field tests.

Pennsalt AE-18 is recommended for use in concentrations of 5 to 7 ox. per gal. of water at temperatures of 140 to 150 deg. F. Depending upon the degree of etch desired, the parts may be immersed for 30 sec. to 10 min., followed by rinsing in a clear water dip or spray.

The compound comes packaged in 300-lb, non-returnable drums. A tican be obtained from the manufacturer.-Pennsylvania Salt Manufacturing Co., Special Chemicals Department, 1000 Widener Building, Philadelphia 7, Pa.

IMPROVES SPREADING:

Wax Activator

An efficient spreading agent, Paraspred, for paraffin and microcrystalline waxes is now in full commercial production. In addition to its spreading properties, Paraspred plasticizes paraffin wax, improving its adhesiveness. penetration of the wax into porous materials such as paper and textiles is greatly improved.

As little as 1 percent of Paraspred added to paraffin wax causes it to spread readily even on damp surfaces. One application is in wax coatings for cheese. Ten percent of Paraspred plasticizes paraffin wax to give flexible, thin coatings of wax. Higher concentrations enable the wax to penetrate into opaque white paper to give trans-

NOW BLIND RIGID LINES

in the COST-CUTTING



HAMER hand wheel operated way

When Hamer Line Blind Valves were introduced years ago, the old expensive and hazardous way of blinding pipe lines with a spectacle bolted between companion flanges became obsolete. The Hamer family of positive, one-man operated line blinding units has now grown until there is a Hamer Line Blind Valve for every application—EVEN FOR BLIND-ING RIGID LINES where no endwise movement is possible.

The new "RIGID" line Blind Valve solves the problem of blinding inflexible lines in refineries, process plants, tankers and other ships ... wherever sigid piping installations must be opened and closed. It's peedy and cast-cutting—one man can reverse the plate in one minute. It's safe—enclosed plate slot prevents spilling line fluid. It's positive—there's nothing like a solid plate for a permanent, leak-proof shut-off.



Positive shut-off without pipe line movement!



Actuated by the hand wheel, a smooth-turning hall bearing mounted ring gear moves the sliding internal sleeve in a straight line to clamp and release the plate, eliminating the need for spread-ing the line. "RIGID" Line Blind Valves conform to A.S. A. Standards for face-to-face dimensions of steel wedge gate valves. In planning new layouts, or modernizing existing installations, use a gate valve for blocking but specify Hamer "RIGID" Line Blind Valves at every point where quick, one-man operated, POSITIVE SHUT-OFF will be required.

SPEED, ECONOMY, SAFETY IN BLINDING FLEXIBLE LINES!

There are Hamer Line Blind Valves for every blinds application. All models feature cost-cutting "one-ma-one-minuse" operation, positive shut-off, and long servi-life. Write for full information.





(Continued)



facturer of pharmaceuticals installed a Tantalum Condenser, and the resultant economies induced him to add seven more. These economies included a 90% reduction in the use of cooling water, elimination of a \$400 yearly maintenance bill, 50% lower original cost, and 64% reduction in his space requirements.

USE TANTALUM WITH ECONOMY for most acid solutions,

and corrosive acids and vapors except HF, alkalis, or substances containing free \$O₃.

PRODUCTS & SERVICES INCLUDE: ELECTRICAL CONTACTS SELENIUM RECTIFIERS

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MATERIALS

You, too, can save by using Tantalum.

If you are processing corrosive solutions with equipment made of short-lived metals or fragile materials, it will pay you to secure full information about Tantalum's many important economies.

Write today to Fansteel Metallurgical Corporation, North Chicago, Illinois.

Fansteel

TANTALUM



New Products, cont. . .

lucence to the paper. Improved adhesive properties of the paraffin are also evident with the higher concentrations.

Paraspred is a non-toxic, soft waxy solid, cream to yellow in color, with a melting range of 92-97 deg. F. It is available in commercial quantities and samples are offered.—Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y.

Cheaper Benzophenone

(172A)

To stimulate use of benzophenone in commercial chemical synthesis, Kay-Fries Chemicals, Inc., long a maker of the perfume grade, is offering a new intermediate grade of benzophenone at a 20 percent reduction in price. Some possible uses: intermediate for certain antihistamines, hypnotics and other pharmaceuticals; intermediate for insecticides, dielectric media and general organic syntheses. Technical data on benzophenone's synthetic possibilities are offered.—Kay-Fries Chemicals, Inc., 180 Madison Ave., New York 16, N. Y.

Diffusion Pump Fluid

172R1

Latest addition to the line of pump fluids made by National Research Corp. is Narcoil-30. It is di-2-ethyl-hexyl phthalate specially treated and tested for high-vacuum use. It is recommended for use in diffusion pumps operating at pressures above 2 × 10-t mm. Hg. Narcoil-30 is the standard type of fluid used in cathode-ray tube plants and electronic tube plants in general. This specially prepared ester is offered in pint, quart and gallon containers.—National Research Corp., 70 Memorial Drive, Cambridge, Mass.

Steam Cleaning Compound

(172C)

Blast, new heavy-duty steam cleaning compound produced by the Du Bois Co., incorporates the characteristics of a good steam cleaning material. It has outstanding detergency; it gives that extra speed and energy needed for fast cleaning of heavily encrusted greasy soils; it is safe on steam cleaning equipment. What's more, Blast has superior water softening and lime and magnesium sequestering ability, so that it will not clog coils, thus assuring trouble-free operation. Blast is one of the few heavy-duty steam cleaning compounds that is odorless. It's recommended for use in all types of steam cleaning equipment. -Du Bois Co., Cincinnati 3, Ohio. -End

September 1950—CHEMICAL ENGINEERING



EFITS YOU GET "We are more than satisfied with our STREAM-

THESE ARE THE BENEFITS YOU GET BECAUSE OF ITS ASPIRATOR AND STREAMLINED FLOW

Maximum Capacity When Needed Most * Accurate Pressure Control Under Youghest Working Conditions * Trouble-Free Service * Smooth Operation * Tight Closure * Accurate Ragulation * Speedier Production Results * Elimination of Failures * Constant Dairvery Pressure * Cost Saving Operation * Ne Spailage * Practically Zero in Mointonance Costs.

LINED Valve performance. They are all over this plant and, frankly, I have forgotten about most of them as I never have any trouble.

"What I like about these valves is that in some cases our initial pressures vary considerably, yet

cases our initial pressures vary considerably, yet the reduced pressure is held steady. This work is all processing and is very important.

"Your competitors will have a hard time convincing me there is a better valve to be had."

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VALVES

A. W. CASH COMPANY DECATUR, ILLINOIS BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES Send for them



Bullatin 959—Sectors the CASM STANDARD Type D Single Seet Presers Reducting volves for one with mest fluids. Show single Inner working point that save in mointenance. Diagram explaint how volve works. Blueprint show simplicity of instellation.



Buffetin 936—features the CASH STANDARD Type 4038 Sect Pressore Valve — designed to extremologisty mointels a constant pressure in the evaporehier corresponding to a operation to present the stoot typespecture desired. Shows an Amountain and Freen Ges Cospectly Chort Inseed on ABCGUITE pressores.





This plant of General Aniline Works at Rensselacr, N. Y., is the modern version of the oldest dyestuffs unit in the U. S.



I Ice manufacturing building produces ice needed in azo dye production. Ice is moved to vats by conveyor system.

Azo Dyes

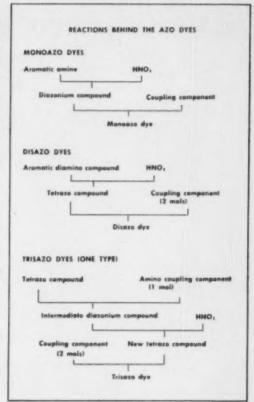


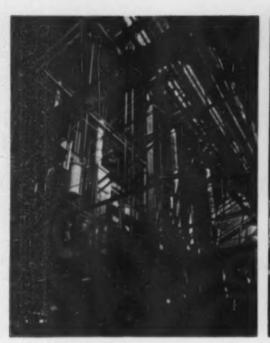
As a chemical class, azo dyes make up more than half of our total dye output. Actual production of azo dyes starts when the proper intermediates have been prepared from coal tar crudes. These intermediates are used to form coupling compounds, diazonium compounds, and (if needed) tetrazo compounds. These are then coupled to get the desired products. To give the readers of Chemical

Engineering a close-up view of azo operations the editors visited the oldest dye plant in the country. At this Rensselaer, N. Y., unit of General Aniline & Film Corp., the most modern dye-making techniques are used. The plant produces many dyestuffs, so a typical azo dye (Direct Deep Black EA) was selected to show how this chemical class of dyes is produced.

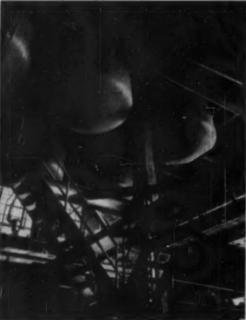
Organic raw materials are benzene and naphthalene. The benzene is nitrated to yield nitro benzene and m-dinitro benzene. Nitro benzene is used to make benzidine and aniline. The m-dinitro benzene is reduced to form m-phenylene diamine. Naphthalene is sulphonated, nitrated, reduced and partially fused to form H-Acid (1-amino-8 naphthol-3, 6-disulphonic acid). These intermediates are used to make Direct Deep Black EA. First step in color production: Benzidine is tetrazotized with sodium nitrite to form benzidine are coupled. Third step: Aniline is diazotized with hydrochloric acid and sodium nitrite to form aniline diazo. Fourth step: Aniline diazo is coupled with H-acid-benzidine tetrazo for the second combination. Fifth step: The m-phenlyene diamine solution is added to form the final combination, and salt is added to precipitate the product.

The product is isolated in filter presses. The paste is dried, ground and then standardized in a mixer with shading colors and reducing agents to match type. Then the final product is filled on weigh-scales, loaded into box cars or trucks and shipped.

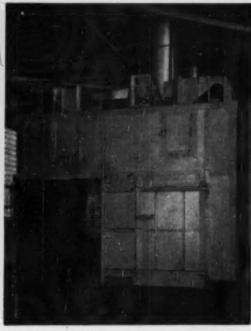




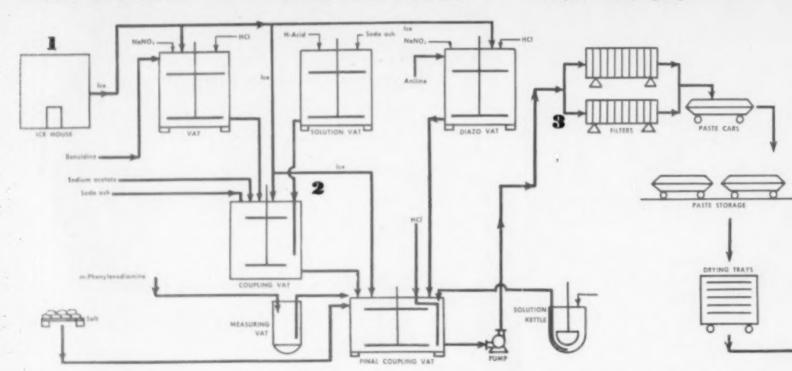
Azo coupling vats utilize gravity for fluid flow. Note complex piping needed for raw material feed lines.



• Filter presses in gallery isolate the final couplings. Paste is removed to cars, then put on trays for drying.

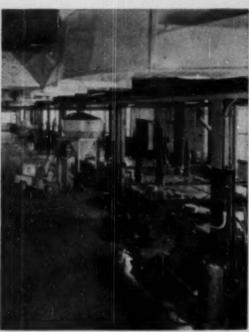


Dryers are used to dry paste which has been placed on trays. Dry filter cake is ready for grinding.





Drying travs containing dried cake are emptied down a chute to drums for movement to the grinders.



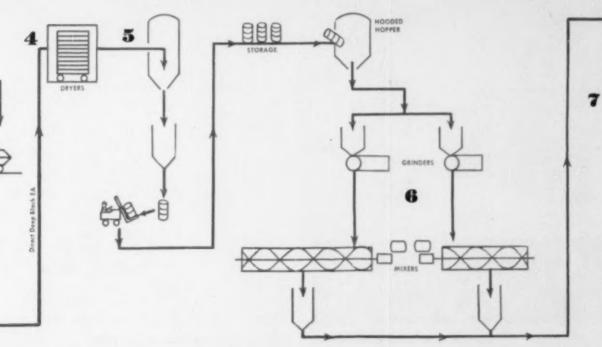
6 Mixers receive the ground products in this modern mix room. After mixing, the batch is sent to the weigher.

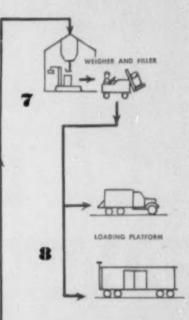


7 Weigher and filler loads drums for shipment. Here, as in every other production step, control lab checks dye.



8 Loading platform is the last step for dyes which pass rigid control laboratory tests. Next stop: consumer.

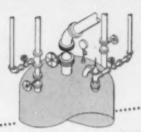




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with dependable CRANE VALVES



PROBLEM: To find a better replacement for valves that needed repairs every 2 to 3 weeks and failed completely

WORKING CONDITIONS: Valve exposed constantly in 3 to 4 months. to hydrochloric acid vapors at 50 psi, at approxito nydrocnionic acid vapors at 20 psi, at approxi-mately 280° F., while controlling raw material inlet

SOLUTION: Crane No. 1671 Ni-Resist Cast Iron Gate line to starch converter. Valve with Crane 18-8 Mo Alloy trim,

RESULT: On last inspection, after 19 months' service without one single interruption, Crane Ni-Resist valve

were still in very good condition. Here's an example of the long life and low-cost maintenance that make Crone Quality the best value in all types of valv

More CRANE VALVES are used than any other

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FITTINGS .

CHEMICAL ENGINEERING-September 1950



Division of AMERICAN MACHINE AND METALS, INC. EAST MOLINE ILLINOIS American Machine and Metals (Canada) Ltd., 1144 Wester Road, Taranta V. Osta

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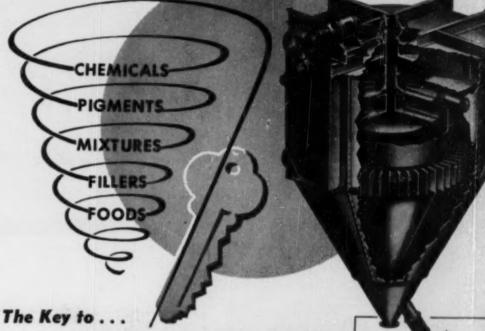


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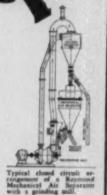
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There is a Raymond Separator for practically every classifying operation. Nine commercial sizes are built with either a Single or Double Whizzer to suit your particular separation problem. A Laboratory Separator is also available for development programs and running test batches.

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PULVERIZER DIVISION

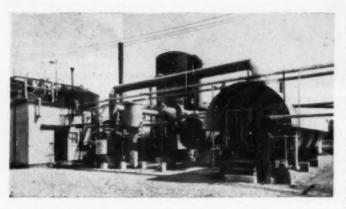
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Chemical Engineering News

JOSEPH A. O'CONNOR, News Editor



Wraps Come off Ohio Contact Acid Plant Revealing Chemico's Radical New Process

Following successful operation in the first commercial installation, Chemical Construction Corp. has announced development of an entirely new and unconventional contact sulphuric acid process. In addition to the ability of the new process to give consistent conversion efficiencies over 99 percent, compared with 96-97 percent for the best previous contact plants, it has other advantages including:

Smaller plants can be economically built and operated.

Investment cost is lower per ton of capacity.

Cooling water needs are much educed.

 The process is simpler; startup, shutdown and operation are easier; and the plant is physically much smaller than a conventional plant of the same capacity.

The first full-scale unit employing the new process has gone into operation at the Hamilton, Ohio, plant of American Cyanamid Co. to supply the plant's needs for alum making, as well as a salable surplus. Rated at 50 tons per day on a 100 percent H_sSO_s basis, the unit has easily reached 120 percent capacity. Currently the plant is producing 60 deg. Be, acid directly—unusual in a contact plant, but it

can readily be switched to produce any strength from 60 deg. Be. to 93-95 percent by a simple operating adjustment. Olcum could be produced by adding oleum towers ahead of the absorbers, but some of the advantages of the new process would be lost in so doing and it seems probable that the main field for the process will be for 95 percent acid and weaker.

With a few exceptions the process differs in every major step from conventional contact plants. Sulphur melting, filtering and burning are conventional, as well as the partial cooling of the SO, in a waste heat boiler, but there is no drying of the combustion air and the burner is operated at nearly 50 percent higher SO, content of the output gas than is normal. Conversion of SO, to SO, takes place in a new "quench type" converter which lacks the usual heat exchangers. It accomplishes conversion by means of a vanadium catalyst in four stages, with cooling between stages by the direct injection of air into the gas stream.

From the converter the SO, gas mixture passes through a two stage absorber similar in appearance to a Chemico drum type concentrator. In the first or high strength stage the gas bubbles under the surface of acid from a dip tube. In the second stage it passes through a weak acid spray. The absorber also acts as a cooler and eliminates the large amount of cooling surface and the large quantity of cooling water ordinarily needed in a contact plant. Only a small amount of cooling water is needed for the product acid which leaves the first absorber stage, and this water is later used for absorber acid makeup.

In the last step the large amount of acid mist created in the absorber is knocked out of the exit gases with a Pease-Anthony venturi scrubber. The gases, steam and mist pass through the throat of a venturi into which weak recirculated acid is injected. The venturi discharges into a small cyclone which catches and returns the liquid to the recirculating tank, venting steam, excess air, nitrogen and a trace of SO, to the atmosphere. (Watch for the complete, illustrated description of this new process that will appear in our October issue.)

SAACI Plans First Clinic on Chemical Sales in November

The first chemical sales clinic sponsored by the Salesmen's Association of the American Chemical Industry will be held at the Roosevelt Hotel, New York, November 2 and 3. It will be attended not only by

It will be attended not only by members of the association but also by other chemical sales managers and salesmen, as well as prospective chemical salesmen and senior and graduate chemistry students who plan to enter sales work.

Among topics to be covered at the two-day session are: selling heavy chemicals; selling fine chemicals; introducing new chemicals; organizing salesmen's records; planning the day. Other subjects to be discussed: "The Entertainment Bugaboo;" "Are Managers People?"; and "A Look Toward the Future."

Cost to SAACI members will be \$20, to non-members \$22.50 and to students \$15. Two luncheons and one banquet are included in this cost. Paul B. Slawter, Jr., Salesmen's Association of the American Chemical Industry, 225 Park Ave., New York 17, N. Y., is handling registrations.

(Continued)



Storage tank area of a new ethylene glycol unit being completed by Ford, Bacon & Davis, Inc. at Carbide & Carbon Chemicals' plant at Institute, W. Va. Columns and the compressor building appear in the background.

Carbide Expanding Capacity To Meet Demand for Glycol

Completion and initial operation of facilities for the production of ethylene oxide at Whiting, Ind., has been announced by the Carbide & Carbon Chemicals Division of Union Carbide & Carbon Corp. These units are part of the corporation's planned large-scale increase in the production of ethylene glycol. Additional facilities at Whiting now under construction are expected to be placed in operation late in the year.

At its Institute, W. Va., plant, Carbide is already producing ethylene glycol from new units that went into operation earlier this year. Further expansion of the production capacity at this plant is also under way. Completion and operation of this capacity is expected during the last quarter of 1950.

To meet increasing demands for ethylene oxide and particularly ethylene glycol for non-volatile anti-freeze, Carbide has been expanding its production facilities ever since the end of the war. Present annual rate of production for ethylene glycol in the U.S. is 210,000 tons. With Carbide's added capacity coming in, as well as that of other producers, it is expected that this figure will exceed 320,000 tons by early 1951.

Chemical Industries Joins McGraw-Hill Family

New names appear on the masthead of Chemical Industries this month. That 36-year-old magazine, published since 1939 by the Maclean-Hunter interests of Canada, has been bought by the McGraw-Hill Publishing Co. Its editorial, circulation, and advertising offices have already been moved to the McGraw-Hill Building at 330 West 42nd St., New York, to share with Chemical Engineering in the editorial and publishing facilities of this organization.

Wallace F. Traendly, publisher of Chemical Engineering, and Sidney D. Kirkpatrick, its editorial director, are to serve Chemical Industries in like capacities.

New CI editor is W. Alec Jordan, formerly news and later managing editor of that publication (see CE's "Man of the Month" page 221). He succeeds Robert L. Taylor, who begins his new duties October I as executive vice president for the Manufacturing Chemists' Association with offices in New York and Washington.

Another new name on the CI masthead is that of Richard L. Demmerle, who has been appointed its executive editor but who will continue his special editorial duties and assignments on Chemical Engineering. For four years prior to joining McGraw-Hill, Demmerle had worked on publications of the American Chemical Society. specializing in interpretative news and technical reports on science and industry. Howard C. E. Johnson, man-aging editor, Herman W. Zabel, engineering editor, and John J. Craig, associate editor, of Chemical Industries continue in their same editorial capacities.

In a signed statement appearing in the current issue of Chemical Industries, Curtis W. McGraw, president of the McGraw-Hill Publishing Co., pledges that organization's support to an expanding editorial program in line with the rapid growth and development of the chemical process industries. He writes: "As companion publications CI and CE will supplement each other, rounding out and

broadening their coverage of this important sector of our economy. Chemical Industries will now draw on the editorial and publishing resources of McGraw-Hill's vast 'network of industrial communication.' It will also have the benefit of the economic and marketing services of the world's largest publisher of business and technical magazines and books. With these facilities and resources at our command, the publishers of CI recognize an opportunity and obligation to supply in concise, readable form the essential information needed by those who are shaping the course and future of America's No. 1 industry."

U. S. Rubber Reactivating Copolymer Plant in Texas

United States Rubber Co. is hard at work reactivating the former Firestone-operated GR-S plant at Port Neches, Tex., under a recent Reconstruction Finance Corp. order. Target date for full operation is November 1. The copolymer plant can turn out a maximum of 75,000 tons of GR-S a

Taking of inventories was completed in August and the plant was turned over to U. S. Rubber by B. F. Goodrich Chemical Co., which has a plant nearby. The Port Neches copolymer plant has been under the custodial care of Goodrich since April 1948.

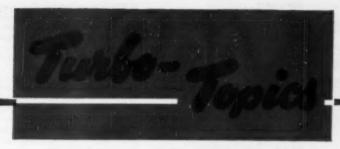
Mobilization Plan Urged For Construction Industry

Establishment of a joint industrymilitary advisory committee to develop mobilization plans for the construction industry in the national emergency has been proposed by J. F. Pritchard, president of the National Constructors Association, to W. Stuart Symington, chairman of the National Security Resources Board.

The National Constructors Association is composed of approximately 20 of the larger engineering and building companies that specialize in the design and construction of chemical plants, steel mills, oil refineries and other types of industrial facilities. During World War II, each of the member companies was wholly engaged in providing production facilities for the war effort.

In his appeal to Symington, Pritchard suggested that a joint industrymilitary advisory and planning committee could be useful to the government in the preparation of a master

(Continued)





TURBO-MIXER CORPORATION UNIT

GENERAL AMERICAN TRANSPORTATION CORPORATION

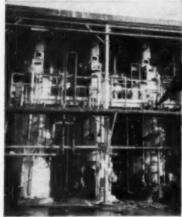


Photo courtesy Industrial & Engineering Chamistry

The intimate contact between catalyst, oil and gas in the Turbo hydrogenators assures Armour & Company of:

- 1. A reduction in conversion time.
- 2. A savings in H.P./Hr. consumption.
- 3. Selective hydrogenation.
- 4. Precise operational control.
- Excellent self-induction of gas from the vapor space, eliminating outside gas or oil recirculation.

Turbo-Mixer Corporation has a background covering many years of successful experience in the supplying of hydrogenators. They are designed for 24-hour continuous service in any desired capacity.

For mixing liquids with liquids, solids and/or gases, with the greatest custombuilt efficiency—see Turbo-Mixer. TURBO-HYDROGENATORS
save money in
processing fats, oils,
fatty acids and
nitriles

To complete the modern design of the new McCook, Illinois plant, Armour & Company's design engineers called on the engineering staff of Turbo-Mixer Corporation for the hydrogenation section. The latest design Turbo-Mixer hydrogenator, both stainless steel and carbon steel construction, were developed for the capacities desired. These units are used for the hydrogenation of fats, oils, fatty acids and nitriles.



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News, cont. . .

plan or blueprint for mobilization of the construction industry and could perform other functions in carrying out the expansion of production and military facilities.

Symington was assured of "the willingness and readiness of the National Constructors Association to cooperate

in such an effort."

Virtually all of our members were heavily engaged in military engineering and construction work during the last war," Pritchard added, "and our collective experience can be placed at the government's disposal in planning for the uncertain period which lies ahead of us as a nation."

Pennsalt Taking Part in Iran's Drive on Malaria

Beginning from virtually a standing start only 10 weeks ago, a team of private American technologists and scientists, backed by private Iranian funds, has completed the first phase in an extensive malaria control program in the Shiraz Valley of Iran, it has been announced by the Iran Foundation of New York, the Pennsalt International Corp. and the Academy of Natural Sciences of Philadelphia.

The three-man American scientific team, assisted by Iranians first trained by the team, has completed DDT spraying of some 145 towns and villages, embracing a population of about 220,000 persons, in the heavily malarial infested district of Shiraz and adjacent areas. At the same time it has completed the first definitive entomological data on malaria vectors of the area and trained and equipped enough Iranian teams to continue the program until this region becomes the hest malaria district to be cleared of

the disease in the country.

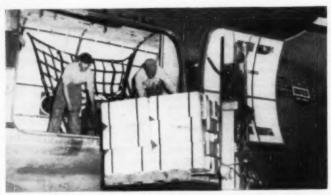
The project is one of a series to promote health in the Shiraz Valley which is now being conducted by the Iran Foundation. This organization, chartered in New York State and en-tirely supported by private Persian funds in Iran and America, has virtually completed a waterworks and is preparing to construct the first general hospital in the Shiraz.

To conduct the malaria project, one of the first essentials before the other could be successful, the Foundation engaged the Pennsalt Health & Agriculture Service, a division organized by Pennsalt International to provide scientific knowledge and technical guidance on sanitation and insect pest

control throughout the world.
"We are committed," said Richard
L. Davies, president of the Pennsalt International Corp., "to the policy of doing all we can to carry out the American Point Four Program, and it is in this connection that we organized the Pennsalt Health & Agriculture Service and undertook this work for the Iran Foundation.

"The quick success of this program —doing in two and a half months what we were asked to complete in six-is due largely to the initiative and direction of private American and Iranian organizations. This experience proves to us that this is the most effective way to accomplish the important objectives of Point Four.

The PHAS team consisted of three field technologists, trained and experi-



CHEMICALS FOR KOREA

Boxes of Halazone tablets to be used for water purification purposes in Korea are loaded abound a DC-4 cargo liner at the Chicago Municipal Airport for flight to San Francisco, whence they will go by ship to Korea. They are part of a shipment recently completed by Abbott Laboratories of North Chicago, III., to fill a government order for 25 million Halazone tablets. Abbott is the biggest U. S. maker of the tablets.

enced in anti-malaria and sanitation practice in other countries and backed up by full facilities of the Whitemarsh Research Laboratories of the Pennsylvania Salt Manufacturing Co.,

the parent organization.

To apply the best available American scientific knowledge to this and other problems, PHAS obtained the cooperation of the Academy of Natural Sciences of Philadelphia. For this project, the organization assigned its managing director, Dr. H. Radelyffe Roberts, widely recognized entomolo-(Continued)

CONVENTION CALENDAR

Drug, Chemical & Allied Trades Section, New York Board of Trade, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa., September 21-23.

American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Roosevelt Hotel, New Orleans, September 25-27.

American Oil Chemists' Society, fall meeting. Sir Francis Drake Hotel, San Francisco, September 26-28.

American Coke & Chemicals Institute, Skytop Lodge, Skytop, Pa., September

American Association of Textile Chemists & Colorists, The Wentworth, Ports-mouth, N. H., September 28-30.

Association of Official Agricultural Chemists, Shoreham Hotel, Washington, D. C., October 2-4.

American Gas Association, Atlantic City, October 2-6

Electrochemical Society, Inc., Hotel Statler, Buffalo, October 11-13.

Fifth Annual Symposium on Instrumentation for the Process Industries, Agricultural & Mechanical College Texas, College Station, Tex., October 11.13

Southwide Chemical Conference, American Chemical Society and Southern Association of Science & Industry, Atlanta, October 16-18.

Engineers' Society of Western Pennsylvania, 11th annual water conference, Hotel William Penn, Pittsburgh, October 16-18.

National Conference on Industrial Hydraulics, 6th annual conference, Sherman Hotel, Chicago, October 18-19.

Society of the Plastics Industry, annual meeting, New Ocean House, Swampscott. Mass., October 18-20.

Technical Association of the Pulp & Paper Industry, Paper-Plastics Conference sponsored by Plastics Committee, New York State College of Forestry, Syracuse, October 19-20.

National Metal Congress & Exposition, International Amphitheatre, Chicago, October 23-27.

Association of Consulting Chemists & Chemical Engineers, annual meeting, Shelburne Hotel, New York, October 24.



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News, cont. . .

gist and specialist on malaria, to accompany the PHAS team and to identify the specific malaria-bearing mosquitoes and recommend and help in directing the proper control measures.

Plant to Use New Process For Electrolytic Chromium

A new plant for the production of electrolytic chromium will be constructed at Sault Ste. Marie, Mich., by the Electro Metallurgical Division, Union Carbide & Carbon Corp. It is expected to be in operation in the spring of 1951, and will adjoin Union Carbide's extensive facilities there for the production of calcium carbide.

The electrolytic chromium operation will be based on an entirely new process, many important steps of which were developed by the Bureau of Mines, U. S. Department of the Interior. Other steps developed by the corporation's laboratories have been integrated with these to make large-scale operation economical. The metal produced by this process is said to be of a higher degree of purity than any commercially produced chromium metal now available.

Principal use for electrolytic chromium is in the special non-ferrous chromium alloys used for metal-cutting tools; heating elements for many electrical appliances, such as toasters and irons; and various parts operating at high temperatures in jet engines and rockets.

Ethyl Corp. Moves to Boost Tetraethyl Lead Capacity

New manufacturing plants to increase Ethyl Corp.'s production of antiknock compounds will be built near Houston, Tex., President Edward L. Shea has amounced. Construction will start immediately and will be completed by the end of 1951. The plant will cost in the neighborhood of \$15 million.

Operations at Houston will be integrated, with all principal intermediate chemicals manufactured on the site so that it will be an independent source of Ethyl antiknock compounds for oil refiners. Furthermore, Sheapoints out, it will provide greater security in time of war. Salt brine will be piped from local wells for the manufacture of sodium and chlorine, and petroleum hydrocarbons will be piped from nearby oil refineries for the manufacture of ethyl chloride and ethylene dichloride.

Ethyl's last big expansion program

was completed in 1949, increasing the capacity of the Baton Rouge plant by more than 30 percent. Additional facilities which will further increase capacity are now being installed and will be in full operation by the end of this year.

Engineering plans for the plant near Houston call for the construction of units to manufacture tetraethyl lead, sodium and chlorine, sodium-lead allov, and ethyl chloride. Other units will include lead recovery furnaces; laboratories; storage tanks for tetraethyl lead, ethyl chloride, chlorine, and ethylene dibromide; a blender; and trackage for a fleet of tank cars for delivery of Ethyl fluid to customer oil companies in the southwestern and western sections of the country.

In addition to Ethyl antiknock compounds, Ethyl Corp. produces metallic sodium, used in substantial volume in the manufacture of detergents; benzene hexachloride, a base for insecticides; and sodium sulphate (salt cake) for the kraft paper industry.

Silica Refractories Plant To Be Constructed in Ohio

A plant to produce silica refractories will be erected at Windham, Ohio, by Harbison-Walker Refractories Co. A 45-acre tract has been purchased for the plant site.

The refractories plant is designed to turn out approximately 20 million 9-in. brick equivalents a year. All features of design and equipment incorporate the latest developments in the manufacture of silica refractories. The site is adjacent to rail and highway facilities.

It is contemplated that the first unit will be in operation within one year.

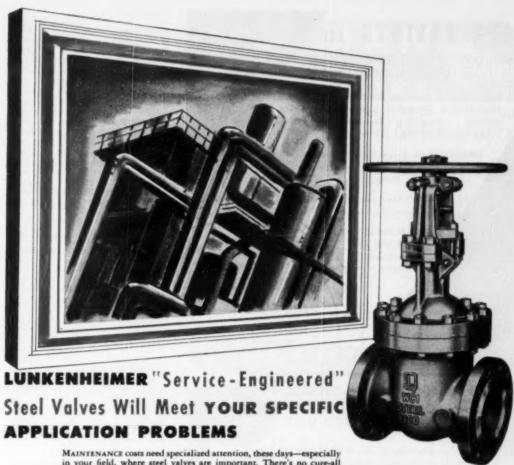
Chicago Area Plant Acquired By Reichhold to Make Resins

Reichhold Chemicals, Inc., has purchased a plant and property in Argo, Ill. The purchased buildings, which provide approximately 150,000 sq. ft. of floor space, will be immediately renovated, enlarged and equipped for large-scale production of a full-line of synthetic resins and for the manufacture of a complete range of organic and inorganic chemical pigment colors.

By the end of its first year of operation, Reichhold asserts, it is expected that the output of the new plant at Argo will reach a minimum of \$5 million, or from 8 to 10 percent of the company's sales in this country.

Establishment of a manufacturing

(Continued)



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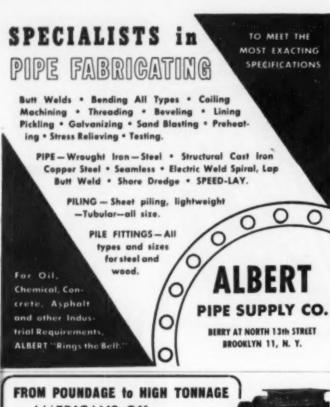
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facture . . . that special Lunkenheimer trim is carefully selected for its service application . . . that stems, bodies, bonnets, gaskets, and even bolts are all coordinated and temperature-rated to give you the correct Lunkenheimer valve for your specific needs. Call in the Lunkenheimer representative in your area. He'll be glad to put at your command all the generations of successful experience behind Lunkenheimer's complete selection of "service-engineered" steel valves. For his address, write The Lunkenheimer Co., P. O. Box 360P, Cincinnati 14, Ohio.

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News, cont. . .

plant in the Chicago area runs the list of Reichhold plants to 18, eight in the United States and 10 in foreign countries. Reichhold, with headquarters in Detroit, is the world's largest producer of synthetic resins.

John Hafeli, now RCI's director of technical sales service in the Chicago district, will continue in that capacity and, additionally, will serve as plant manager at the Argo plant, assisted by S. Severin as chief engineer and William Lang as plant superintendent.

Production and warehousing facilities at the Argo plant will greatly expedite the company's service to manufacturers in the Chicago, Milwaukee, St. Paul, Minneapolis, St. Louis and Kansas City areas.

Plant Will Get Hydrocarbon Chemicals from Natural Gas

Delta Chemical Co. will build a \$30 million plant on the west side of the Mississippi River opposite Pointe a la Hache, La. There will be lines for gathering natural gas in the Mississippi Delta as far west as Erath in Iberia Parish. The plant will employ low-temperature absorption for the recovery of ethane and propane and the conversion to ethylene and other chemical products.

J. E. Pottharst of the Delta Power & Gas Co. is head of the newly organized Delta Chemical Co. The Wyatt C. Hedrick Engineering Corp. of Houston, Tex.. has the general contract for engineering and construction management.

Davison to Use Spray Dryer For Making Fluid Catalysts

Davison Chemical Corp. is converting part of the capacity of its Cincinnati, Ohio, synthetic fluid catalyst plant from the ground type of production process to the spray-drying method.

Important to the new equipment being installed is a spray-drying chamber built entirely of stainless steel. This spray-drying chamber measures 22 ft. in diameter by 14 ft. straight shell and 30 ft. cone. It is the largest piece of such equipment ever installed for the purpose of making synthetic fluid type petroleum cracking catalysts.

The spray-drying chamber will produce a microspheroidal form of catalyst having uniform particle size distribution. These physical properties are preferred over the ground type of catalyst for some of the new processes in use in petroleum refineries. Within the chamber the material is processed in counter flow with flue gas. The flue

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gas is supplied by an air heater, standard vertical, up-fired, pressure type, fitted to burn either oil or gas.

A new washing system is also being installed, which is said to give the catalyst similar, but improved, chemical characteristics,

Basic design requirements for the new equipment were worked out in the Davison laboratories. Design details were developed by operating fullscale pilot-plant equipment on a semicommercial basis. Installation is expected to be completed and production under way by October 1950.

California Refinery Gets New Vacuum Flasher

What may be the world's biggest vacuum flashing unit is to be built by M. W. Kellogg Co. at the Richmond, Calif., refinery of Standard Oil Co. of California. Its construction is part of a general modernization program at the refinery. The unit will charge 55,000 bbl. of reduced crude a day.

According to Kellogg, the main vessel in the unit will stand 80 ft. high and will have a maximum diameter of 27 ft. Its design capacity is believed to exceed by 15 percent the largest vacuum unit currently in operation.

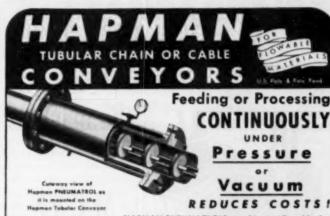
The unit is being designed to provide approximately 30,000 bbl. of feed each day for the existing catalytic cracking unit at Richmond, which is scheduled for revamping during the modernization. Asphalt—the other major product from the flasher—will be charged to visbreakers to produce high quality fuel oil and gasoline.

Slated for completion in May 1951, the new unit will charge not only reduced crude from California Standard's Richmond and El Segundo refineries, but will also process some heavy so-called "non-refinable" crudes,

Out Go Fixed Beds, In Come Moving Ones in Cat Crackers

Socony-Vacuum Oil Co., Inc., will build a new Thermofor catalytic cracking unit at its refinery in East Chicago, Ind., providing a total of eight such units under construction or to be completed during 1950. The construction contract has been let to C. F. Braun & Co.

All of the new TCC units with moving-bed catalysts will replace existing Houdry fixed-bed units. They will provide an increase of 50 percent over the present 10,000 bbl. per day capacity of each Houdry unit for a total throughput of 120,000 bbl. daily of high-quality automotive and aviation gasoline and other products. Each (Continued)



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point to another, or you can handle products into and out of pracessing zones, eliminating time-consuming batch methods.

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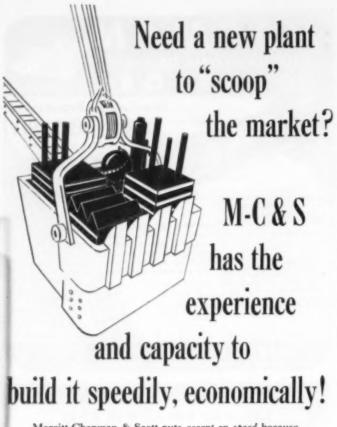
An interesting additional advantage worthy of investigation is this: some products made with spent acid have better physical properties than those made with high-purity acid.

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News. Cont. . .

barrel, of course, is equivalent to 42

In addition, the improved and simplified design that the company developed for its new TCC units will effect substantial reductions in investments and in operating costs, and will increase the flexibility of operations.

Besides the construction at East Chicago, Houdry units are also being converted to TCC at company refineries in Buffalo, N. Y.; Beaumont, Tex.; Brooklyn, N. Y.; Trenton, Mich.; and Augusta, Kan.

Construction of two more of the TCC units of simplified design at the Cleveland refinery of Standard Oil Co. of Ohio has been licensed also by Socony-Vacuum.

World's Biggest Cat Cracker For Gulf Oil at Port Arthur

Contract for the construction of a 60,000 bbl. per day fluid catalytic cracking unit has been awarded by Gulf Oil Corp. to the M. W. Kellogg Co. The plant will be erected at Gulf's Port Arthur, Tex., refinery. Anticipated output will be about 20 percent greater than that of any similar installation currently in operation or under construction by any other firm.

The new cat cracker will produce ingredients for aviation gasoline, materials for synthetic rubber production, high-quality automotive gasolines and fuel oils. It is scheduled for completion during the late summer or early fall of 1951. Cost of the addition, with auxiliary equipment, will be about \$8 million.

While the unit will be the world's largest, total output of the refinery will not be increased materially above the present 230,000 bbl, per day. It will enable the company, however, to increase its production of higher octane gasolines for both military and civilian use.

The new plant will be virtually automatic in operations and will embody the latest design features. The unit will cover 148,400 sq. ft. of ground; at its highest point it will approach the height of a 20-story building. Every phase of the process will be regulated by electric or pneumatic controls that will enable refinery technologists to know the status of the operation in any part of the unit at any time.

"Our decision to build this new cat cracker at Port Arthur," comments T. J. Sullivan, Gulf vice president in charge of manufacturing, "is a result of the desire to be prepared for the days ahead. The equipment will have a high degree of flexibility and with it Gulf will be in better position to supply needed ingredients for military aviation gasoline and synthetic rubber as we may be asked to do. If the need for these products diminishes, exceptionally high quality automotive gasolines and fuel oils for home heating and industrial uses can be produced."

Completion of the plant at Port Arthur will follow by just two years the installation of 20,000 bbl. per day units at both Toledo and Cincinnati, and will raise Gulf's total of cat crackers to eight.

First Offshore Pipeline To Tap Gulf Natural Gas

A contract has been awarded to the Submarine Pipeline Construction Co. by the Marine Gathering Co. of Houston, Tex., for the construction of the first natural gas pipeline into the offshore tidelands area of the Gulf of Mexico.

The underwater pipeline will be \$\frac{3}{2}\$ in. in diameter and have a daily delivery capacity of 50 million cubic feet. The line will be buried beneath the ocean floor. Gas will be carried from the wells of Pure Oil Co. in the Culf to the Tennessee Gas Transmission Co. on the Louisiana mainland in Vermillion Parish.

Third and Last Butyl Unit Reopening at Baton Rouge

The Office of Rubber Reserve of the Reconstruction Finance Corp. has ordered the reopening of the third and last unit of the government-owned butyl rubber plant operated at Baton Rouge, La., by Esso Standard Oil Co., it has been announced by H. J. Voorhies, general manager.

"This action," says Voorhies, "follows the previously announced decision of the government to put the second unit back into production, and means that the output of the plant will be increased to its full capacity of 42,000 long tons per year when the third unit is ready for operation in about five months." He says the company expects to call back into service about 200 men who were laid off during 1949.

Nitrogen Solutions to Come From CSC's \$1 Million Unit

Commercial Solvents Corp. will construct a \$1 million addition to its ammonia plant at Sterlington, La., to produce nitrogen solutions. The (Continued)

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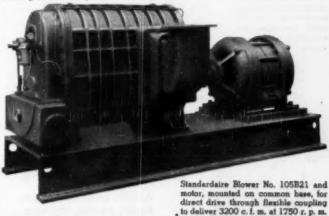
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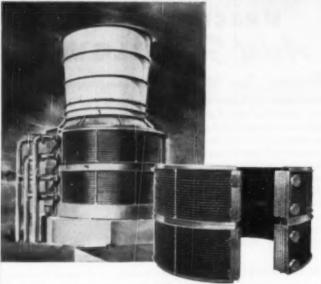


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News, Cont. . .

new unit will be located on the site of the present Sterlington plant which makes anhydrous ammonia from natural gas. It is scheduled to be in operation the first part of next year.

The Sterlington plant, constructed for the government during the war by Commercial Solvents, was purchased for \$6 million in 1946. A large amount of the anhydrous ammonia production is being used for direct application to the soil, principally in Louisiana and Mississippi. Production of nitrogen solutions will broaden the company's base in this field and put Commercial Solvents in a better position to serve the fertilizer industry.

Sulphur plant on the Starks Dome in Calcasien Parish, La., is being built by Jefferson Lake Sulphur Co. Capacity will be 500 tons of sulphur per day. The plant should be ready to operate in February 1951. The company has arranged for sulphur rights with the Texas Gulf Sulphur Co., which found sulphur in the dome in commercial quantities. Jefferson will continue to operate sulphur mining plants at the Fort Bend and Clemens Domes in Texas.

Paper from bagasse will be made in a new mill at Xicotencatl, Tamps., Mexico. The mill is expected to be completed before the grinding season for the new crop of sugar cane gets under way in January or February 1951. The firm, Ingenio Guayalejo, has a sugar refinery at Xicotencatl which will supply the bagasse.

Electrolytic plant of Southern Alkali Corp. at Lake Charles, La., which produces chlorine and caustic soda, is undergoing expansion. This company, jointly owned by the Columbia Chemicals Division of Pittsburgh Plate Glass Co. and the American Cyanamid Co., also operates a soda ash and electrolytic plant at Corpus Christi, Tex.

Carbon black plant will be built by Godfrey L. Cabot, Inc., at Big Spring, Tex., adjoining the refinery of Cosden Refining Corp. A contract signed by the two companies calls for Cosden to supply Cabot with residual fuel oil to be converted into carbon black.

Modernization program for some of its units has been launched by Ethyl Corp. at its Baton Rouge, La., plant. There will also be some expansion. Central shops, stores, office and change house will be among auxiliary structures added. Cost of the construction: between \$2 million and \$5 million.

READERS' VIEWS AND COMMENTS

Titanium Ballyhoo

To the Editor:

Sir:-I was most interested in your Corrosion Forum article on titanium which appeared in the May 1950 issue of Chemical Engineering. We have been doing a small amount of corrosion testing in the laboratory with some samples of this material. One thing we found that under the usual laboratory conditions which will cause stress corrosion cracking freely on austenitic stainless steel does not crack titanium. I refer here to 42 percent boiling magnesium chloride and to certain concentrated white liquors used in the sulphate process for wood digestion, Titanium seems to be particularly resistant to both of these. We have made a number of tests in phosphoric acid and in boiling 85 percent Baker's phosphoric acid titanium just disappears. It is one of the most dissolvable metals we have ever tested in phosphoric acid. Reference was recently given in Iron Age concerning the use of hot salt baths for descaling. Here it was mentioned that titanium reacted very violently.

I believe that your article on titanium is timely and I am pleased to see you treat the subject in the manner you have. You are certainly correct in saying that there is certain hubbub about titanium and I am just enough of an "oldie" to question about 95 percent of this wonderful talk about titanium and want to get the facts first before jumping on the bandwagon. It is apparent that the government agents are "whooping it up" also and talking about welding it in

heavy thicknesses.

There is also talk about plating it from hot baths, but nothing of a commercial nature has come of this as yet. I have yet to see a laboratory sample, but learn that it can be done. There is no doubt that titanium is useful in salt water under typical marine conditions where fouling occurs. I suppose people will want to be using it for sheathing piling next or even go to lightweight hull structures.

M. A. SCHEIL

Director Metallurgical Research A. O. Smith Corp. Milwaukee 1, Wis.



...but Important News for Business!

Darco Corporation, formerly an unconsolidated subsidiary, is now an integral part of Atlas Powder Company. Present Darco personnel and facilities—manufacturing, sales, and research—are continued in the Darco Department.

Darco plant expansion at Marshall, Texas, is being pushed to completion. With this added capacity—backed by Atlas Powder Company's resources and extensive research, development and engineering facilities—Darco is set to maintain its position as a leading manufacturer of activated carbons for the refining of cane, beet and corn sugars, for the purification of chemical products, vegetable oils and fats, water supplies, textile chemicals and dry cleaning and electroplating solutions.



DARCO DEPARTMENT

ATLAS POWDER COMPANY

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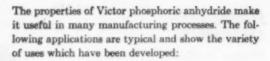
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The Human Equation

RICHARD L. DEMMERLE, Associate Editor

Some Laymen Are Still Wary of the Aims and Thoughts of the Technical Man. Why?

Two nights before this column was written the writer was spending a quiet evening at home with pipe, beer and a fairly good "whodunnit." His mind was at ease. A topic for the column had been picked and only the mechanics of writing it remained to complete his assignments for the September issue of this magazine. The immediate problem that worried him was whether or not his guess as to the identity of the culprit in the invstery yarn jibed with that of Sean McQuire, the bourbon and blonde-loving private optic who ran through its pages. The scene was obviously one of complete tranquility and then . . . the phone

If was Cliff Hampel, of the Armour Research Foundation, an old friend from our days on the Manhattan project. He was calling from LaGuardia airport while waiting out a twenty minute interval between planes on a flight from Chicago to Milan, Italy. It seems that Cliff was on his way to fill a few speaking engagements before European technical groups and at the same time get a current picture of the chemical process industries in the old country. After customary greetings were exchanged the author of the "Human Equation" green with envy, declared how nice it would be to compose that epic beside the blue waters of the Mediterranean. This was a sub-tle way of getting Cliff to comment on the HE, . . . which he did favorably since the operator was about ready to collect his nickel. But his parting shot, as the coin jangled into Mr. Bell's pocket was "It's fine to talk about how the engineer can get along with laymen, Dick, but, now and then, you ought to write something about the laymen and their relation to the engineer." And with that Cliff was off to Milan but I couldn't get back to my book.

His suggestion, of course, involves an analysis of the conception most laymen hold of the engineer and the technical man in general. Such an analysis would take a pollster a year or more to collate and a volume or two to record. But it is safe to assume DIFFERENCES OF OPINION

Demons?

"He has something demoniacal about him who can discern a law or couple two facts."

Thoreas (1863)

Or Angels?

"There is no possibility of telling whether the issue of scientists' work will prove them to be fiends, or dreamers, or angels."

Lord Rayleigh (1939)

that the results would show that the layman views the technical man with respect, but with a respect phrased in coolness and a modicum of apprehension. The reason given for this feeling would be that the engineer or scientist is an objective minded fellow who builds bridges, splits atoms and concocts gooky messes principally for his own amazement even though these undertakings usually work out to the benefit of mankind in the long run.

Hollywood and headlines have done a lot to gain rightful recognition for the technical man and his work. But unfortunately their glamorizing has at the same time endowed him with a fourth dimensional heartless person-ality in the eyes of many laymen. Scientific societies and the managements of technically based companies realize the portent of this wrongly held impression. By more accurate press relations and the opening of the doors of their meetings and plants to qualified laymen they are doing their part in making the public realize that the technical man is a fellow trying to make a living by making living easier for others.

In his home, his social and business groups and in his community the brunt of this crusade must be borne by the individual technical man. He'd do well to take a page from the physician's book, the one technically-trained man who's succeeded in convincing laymen that he's on their side, fighting their battles, for their best interests.

But the layman too must be en-

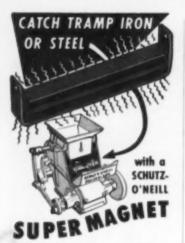
listed in the campaign to close the gap between the technological spearhead that cuts the path for our civilization and the main body of mankind. He can serve by improving his gencral familiarity with scientific subjects and most of all by trying to understand the spirit and approach technical men use in developing their thoughts.

The layman, for instance, is used to thinking in terms of constants, real or fancied. He is impatient, though at times justifiably, with the manner in which technically trained men insist on treating almost every aspect of a technical or even social situation as a variable quantity. And when they start drawing relationships among the variables, that's just too much. How much easier, the layman argues is the flat statement: "It takes about two gallons of gas to run a motorboat from A to B" than the technical man's qualified observation: "There are many factors to be considered. First the shape of the particular hull. Second, the horsepower rating of the motor, the speed at which it will be operated and fuel efficiency that can be expected to prevail at that speed. The type of fuel that will be used is another item that must be taken into account. And finally the water and weather conditions must be evaluated. Will the tide be favorable? Will there be a headwind? Will there be a choppy sea, etc. etc.'

The difference is obvious. The layman is interested in specific, easy-to-remember truisms with which to guide his actions. The technical man is interested in the development of all-cunbracing formulas or systems which when fed with appropriate data will give the information needed for case x, y or z. Put another way, the technical man is leery of "constants" but the layman worships them.

This clash of thinking habits is the biggest obstacle to the growth of mutual understanding between technical men and laymen. And it will be the big job of education to break down this barrier so that the general public can appreciate and enjoy the fruits of advancing technology. The layman, however, must make himself tolerant of and receptive to thinking in terms of formulas rather than

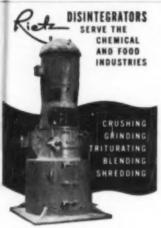
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THE HUMAN EQUATION, CORT. . .

isolated facts. If he is fair, he must admit that whenever in his lifetime he developed a proficiency in doing anything, from horse shoeing to piano playing, it was because he had mastered a means of considering and handling several variables simultaneously. By the same token he will find that most of his failures stemmed from a dependence upon "constants" that subsequently proved to be variable.

But even if the layman gives the technical man credit for thoroughness in thinking he will invariably blame him for the "mess" this thinking has made of the world. Technological unemployment, efficiency experts and the squelching of individual craftsmanship are laid at the doorstep of the engineer and all the pent-up frustrations of living at a stepped up pace fly in his face when he opens his door.

At the bottom of this is that old meaty chestnut, "Man in the Machine Age," which has been picked clean time and time again at intellectual tea parties and in the books written by people who inspire these gatherings. But in the last ten or fifteen years this topic has gained new and real importance and the attention of serious thinkers who never drink tea. Critical lavmen will be happy to know that the engineer and the technically trained management man are in first ranks of those who are concerned with the problem of keeping the machine the servant of man. For evidence of this let him refer to the current technical journals where the predicament of man in the world that science wrought gets as much space as it does in the popular magazines where it has always been a sure readership getter.

The dangers to physical health of the workers that technology brought with it have been or are in the process being quite thoroughly conquered. This was not done by a moratorium on science, an oft suggested panacea for everything from atom bombs to dishpan hands, but by an acceleration and diversification of technical endeavor. Industrial toxicology became a sister study to process engineering and civic planning became part of plant planning. The engineer had learned that the consideration of the human factors of a project were as weighty and important as the material aspects.

It is just this type of double edged approach that will have to be used to solve the morale and psychological problems of modern technology. This is a big job and laymen can rest assured that engineers and management men are spending a lot of

sleepless nights devising ways to tackle it. The crux of the problem les in the anxiety manifested in the production line worker of today. Though he eats better, lives longer and works shorter hours than his predecessor of a few years ago he does not get the creative "lift" out of his job. Too often it has been stripped by work specialization of a means for him to get a feeling of total accomplishment. Too often working for a living has become just . . . working for a living has become just . . .

working for a living.

Fortunately, in the chemical process industries, the streamlining of production has not brought about this bleak situation. The general trend from batch to continuous processing has increased rather than decreased the creative scope of individual workers. The operator in the well instrumented process plant can get the feeling of accomplishment that comes from the control of a smooth running unit of equipment in the performance of a whole job.

But there is a danger of human dissatisfaction from another source in chemical processing work. The final product is usually an intermediate material and the workers in the plant where it is produced seldom get an opportunity to see how it will be used or in what form. The product's ability to meet cold technical specifications is the only index by which chemical production people can judge the quality of their work. Even the bored autoworker can get a feeling of pride in looking at a beautiful car whose hubcap he polished. But it's hard to work up a pride in the paternity of a tankear of butadiene.

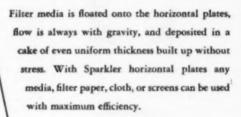
Many human-wise chemical managements are aware of this situation and arrange "your product-in-use" displays and lectures for production personnel and their families. At these sessions the need behind a specification can be made apparent and the havoe that a product inconsistency or impurity can raise in the customer's plant or with his output can be vividly portrayed. These explanations already stress the key role played by the production people who manufacture the starting materials for the consumer industries.

Yes, there's little doubt that the human and his aspirations are in the industrial picture everywhere. Whether it's the man who makes the machine, uses it or uses its products he must be considered as an individual. In this industrial scheme there is no room for distrust of the men who create technology by those who enjoy its benefits. Neither can those who use it be lacking in their responsibility to the groups they now serve and employ.

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Packaging Notebook-V

METAL DRUMS

The chemical industry depends upon metal drums to transport a substantial percentage of its products. These containers, fabricated from steel, aluminum, nickel and stainless steel, are made in a large variety of constructions to meet the many special conditions required for the vast array of chemicals that they carry.

The last 20 years has been an important era in the life of these containers. Efforts of the Steel Shipping Container Institute, individual drum manufacturers and the Metal Packages Committee of the Manufacturing Chemists Association have brought forth many improvements and betterments. Development continues at an accelerated pace and the prospects for further important changes of a beneficial character are hyight

Metal drums are divided into two general classifications—those which carry (1) liquids and (2) dry materials. Each type is made in the returnable and single trip construction. For some years the trend has been towards the single trip container. Although in some instances the one trip container costs more than the per trip cost of the returnable type, it has the advantage of elimination of record keeping and prevents misunderstandings with customers. Each use usually has certain special considerations and the costs and other factors such as safety must be considered before the most practical container can be

Single trip drums used for packing dry materials are generally made of 20 to 28 gage metal. They are utility containers fabricated to hold any reasonable amount of product—actually a tailor made container. Each manufacturer has standard diameters but lengths can be varied within reasonable limits. Many types of openings are available, ranging from the full open head type to friction covers of small diameter. (See illustration.)

Certain special constructions are authorized by the Interstate Com-



merce Commission for transporting such dangerous articles as some explosives, flammable solids, oxidizing materials and poisonous substances. These drums when used for transporting nondangerous compounds must be made to meet the requirement of the Consolidated Freight Classifica-tion's Rule 40 Section 5d. The thickness of metal is not specified in this Rule but containers are only authorized for one shipment. Returnable containers must meet the provisions of Section 5c of this Rule. Spec.37D, E, F, G, H, and K drums, fabricated to meet the ICC requirements for transporting certain dangerous articles, may be reused for non-dangerous compounds although they are embossed S.T.C. (single trip container)

Side seams are usually lap welded or of the "Gordon Box" type-the welded seam is stronger although it often costs more. Sidewalls of the drums can be corrugated if desired. This imparts stiffness to the container. Some fabricators claim that corrugating stretches the metal and causes severe strains on the side seam.]

Head seams are of the double seamed type (see illustration). If properly rolled this provides a most effective joint of the head and the cylinder. Where needed, a seaming compound can be used to provide a water tight joint. If at any time the question of a faulty head seam arises, it can be answered by cutting out a wedge shaped section of the chime with a hack saw. Examination of the section will show whether the seam has been properly formed. These light gage steel drums are available equipped with a large variety of openings. A few of the more popular types are described below.

Friction lid is probably the most commonly used. It is a cheap and effective closure when the bearing surface between the flange of the opening in the drum and the flange of the cover is sufficient to provide a tight fit. A lid with a depth of & in. is adequate. Friction lids are used in diameters ranging from 4 in. to 18 in. -the smaller the opening the stronger the closure and the less likelihood there is that the cover will "pop out." Openings may be located at any convenient place in the drum head provided they are at least an inch from the head chime.

Friction covers are sometimes fastened in position with three or more turnbuckles or channel clips. A small hole drilled in the side near the end of these clips provides a convenient means of securing them in place with wire. A lead seal can be applied to the wire if it is desired to provide (Continued)



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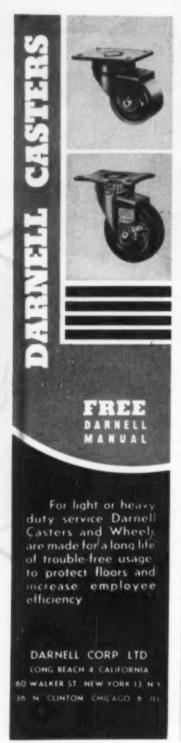
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proof against tampering. These clips are fastened to the drum heads with rivets. Unless the rivet holes which are pierced through the drum heads approximate the size of the rivets and unless the rivets themselves fit closely it is possible that water and water vapor may pass through these holes to the inside of the containers with resultant dilution or contamination of the contents of the drum.

Friction lids may also be secured in position by reaming. It is necessary that the flange of the cover extend below the flange of the opening in order to obtain a tight seal by this means. It must be borne in mind that when a reamed friction lid is removed it is impossible to seal it again effectively.

Bolted cover is a popular closure for drums holding pastes, greases, as well as dry materials where large openings are desired. The bearing surface is between the head of the drum and the flange of the cover. A gasket is ordinarily required for a tight closure. Nuts pressed into the under side of the drum head secure the 4 or $\frac{\pi}{10}$ in bolts that hold the lid in place.

Screw lid has been a popular closure for calcium carbide drums. The effectiveness of the seal is limited by the accuracy of the threads that are pressed into the flanges of the head of the drum and the cover. A gasket is required for a tight seal.

Lug cover drum has been used for many years by petroleum producers for packing greases. A sealing tool is required to press the lugs of the cover under the coiled head opening. A gasket, usually tubular, is required for an effective seal.

Full removable head is the most popular type due to the ease of filling and of dispensing from the drum. This closure is invariably the customer's choice but it must be borne in mind that it cannot withstand as much abuse as the tight head con-struction with a smaller opening. Gaskets of varying types are required to provide a tight joint between the curled chime of the drum and the head. The head is secured to the drum with a ring which is drawn tight with a lever or a bolt. Various means have been used to increase the strength of this closure. Some of these include use of heavier gage metal in the heads and rings, also the use of corrugations in the heads and sidewalls adjacent to the chime have been used.

As a result of an investigation by the Steel Shipping Container Institute and the MCA's Steel Shipping Container Committee means of strengthening this closure have been devised. They involve only minor changes in construction and it is hoped that these improvements will soon be adopted.

The choice of opening will depend on the filling facilities, the transportation abuses likely to be encountered, characteristics of the product, and last but not least the customers preference. Careful consideration of these factors at the outset will guard against future troubles.

The gage of the metal required for drums depends on several conditions which vary greatly. Containers which are designed to transport products which are fused solid (rosin, resins, etc.) can be fabricated of 28 gage steel. Pulverized materials which do not support the containers should be packed in drums of heavier gage. In addition, the size of container, type of opening, and weight to be packed are important considerations in choosing the right thickness of the metal.

With so many varying possibilities, no set rule can be followed. Perhaps the best guide available to shippers is the accompanying tabulation of the minimum steel gages authorized by the ICC (Spec.37D, E, F, G, H) for light gage drums for transporting a variety of dangerous articles. These specifications vary in required steel thicknesses in recognition of the degree of transportation hazards of the many groups of chemical compounds that are packed in these containers. For example, Spec.37D druins are used for packing the more hazardous inflammable solids while poisonous solids including cyanides are packed in Spec.37H drums. Only drums of tight head construction are covered in this table. The steel thicknesses shown in the table are minimum requirements. Often steel of heavier gage than the minimum is used. Where containers for non dangerous materials are concerned, the lighter gages

Metal Thicknesses Light Gage Steel Drums

			Min.
100	Capacity	Max. Weight (Gross Lb.)	Inicane
Spec.	(Gal.)	45	28
31H	5-10 3-55	5.07	2.6
37D 37E	3-55	80	24
37F	5-85	50	26
315	5-55	80	28
37G 37H	5-35	145	26
370	3-55	160	22
3716	3-55	160	2.5
37F	5-55	160	26
370	3-55	160	28
37E	2-55	220	24
37H	5-20	245	24
37H	5-55	245 245	
37F	5-55	275	24
3713	3-55	300	70
370	5-55	325	26 26 19
37D	3-55	425	7.50
27E	3-55	425	22
37F	5-55	425	24
3763	5-55	425	24
37G	3-55	480	19
3710	3-55	4.80	22
37F	5-55	480	24
370	5-55	480	26
37D	2-55	880	18
3710	2-55	880	20
375	5-55	880	22
3703	5-55	8.50	24

shown in the accompanying table may prove adequate.

It is not possible to make any recommendations on metal thicknesses for full open head drums until the results of the investigation mentioned previously are available.

The light gage drums may have interiors lined and exteriors coated by the conventional methods including the use of high bake resin linings and coatings. Containers may be decorated with company trade marks, etc. by printing or using silk screen process.

Information on steel drums for liquids and returnable metal containers will be included in a forthcoming issue.

Packaging Show—American Management Association's 20th. National Packaging Exposition will be held in Atlantic City, N. J., April 17-20, 1951.

Paul O. Vogt, coordinator of package engineering and development, General Electric Co., has been recently elected a vice president of the association in charge of their packaging division.

R. D. Handley, advertising manager, Sylvania Division, American Viscose Corp. has been elected chairman of the exhibitors advisory committee for the forthcoming exhibition.

Chemical and Tunnels—After the Holland Tunnel fire, the State of New Jersey enacted legislation for the regulation of truck transportation. With authority stemming from this enabling statute, the New Jersey Department of Labor and Industry has published a set of tentative safety specifications which regulate the motor carrier transportation of dangerous articles.

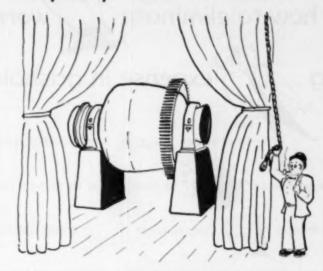
Enforcement has been placed in the hands of the state motor vehicle inspectors and state, county, and municipal police officers.

These tentative regulations are patterned after the Interstate Commerce Commission's Regulations. Placarding requirements, more stringent than those of the ICC were the subject of a hearing at Trenton, N. J., on July 6.

Effective July 28 vehicles hauling flammables and explosives are excluded from the tunnels of the Pennsylvania Turnpike at all times. Trucks containing these commodities, when carrying proper identifying signs, may use the Turnpike where travel through tunnels is not required except on such days that the commission will indicate from time to time.

-End

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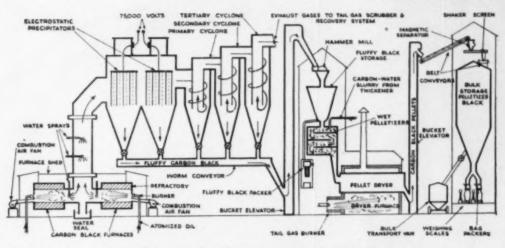
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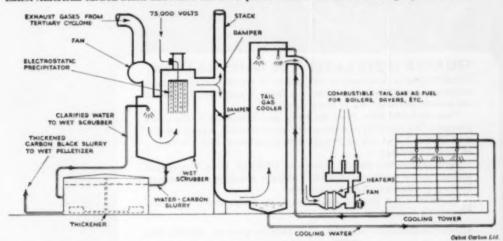


News From Altroad

SPECIAL CORRESPONDENCE



Latest American carbon black know-how has been put to work in this ECA-backed project . . .



. . . including smoke eliminating scrubbers and electrostatic precipitators as . . .

Cabot Opens Carbon Black Unit in Britain

London—First American-owned plant to be built in the United Kingdom under a Marshall Plan investment guarantee—the Cabot carbon black plant at Stanlow, Ellesmere Port, Cheshire—was formally opened on Friday, July 28, by the Rt. Hon. Harold Wilson, President of the Board

of Trade. The plant has actually been in production since early July.

Cabot Carbon Limited is a whollyowned subsidiary of Godfrey L. Cabot Inc., which invested nearly \$2,400,000 in the new British subsidiary.

The modern "sootless" plant is on the south bank of the Mersey River, a little upstream from Liverpool. It is the first to be built under the ECA investment guarantee program which was created to attract more American capital to assist European recovery. With the approval of the British Government, ECA assured Cabot of a return on its investment up to a total of \$2,025,000.

The plant of Cabot Carbon Ltd. (Continued)



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is designed for production by the furnace process—using liquid petroleum residues as raw material, rather than natural gas. As such, it resembles many of the plants of its American parent company—and further exemplifies the present trend in carbon-black manufacturing to locate the plants near the consumers, rather than near the sources of raw material. The American Cabot firm was a pioneer in this development.

But in the British plant there is one notable improvement even over current American practice: a tail-gas recovery plant which not only climinates smoke but also yields more carbon black and also sufficient clean fuel to fire the boilers for central heating of the offices and laboratories, for heating the rotary dryers, and to preheat the liquid raw materials. This recovery plant added considerably to the cost of the whole plant, which to-taled approximately \$1,400,000. For a plant of similar capacity (60,000 lb.) in America, the cost would have been somewhat less. But by using a cheap residue of petroleum refining. and by such utilization of the exhaust gases, the overall economy of the plant is competitive with that of any other process. Moreover, the plant is not creating a smoke nuisance.

The plant, based on Cabot specifications, was designed and built by the Stockport firm of Simon-Carves Ltd., specialists in chemical-plant construction, with the assistance of a number of sub-contractors.

Completion of the first unit of the plant will provide Britain some 8,000 to 10,000 tons of home-produced carbon black per year-saving her an estimated \$1,000,000 annually. Mr. Wilson mentioned Britain's requirements of this essential raw material (for "toughening" rubber, and for pigments in the manufacture of ink and paint) as 30,000 tons a year, all of which, until now, has been imported, and has cost about \$11,000,-000 every year. In the face of such circumstances, it is natural that the Cabot plant has been designed to accommodate additional units.

The plant is almost wholly automatic, only 60 men are required to run it. Use of liquid petroleum residues as raw materials made the location of the plant at Ellesmere Port a natural choice. The oil residues are brought by tanker from the Gulf of Mexico up the Manchester Ship Canal to within a mile of the factory, then delivered by pipeline to the works.



Although at present the raw materials are all imported from the United States, the firm eventually hopes to draw on byproducts from British refineries. (The new Shell refinery at Stanlow, and the Manchester Oil refinery project at Partington, are both close by the Cabot plant.) This will aid still further in balancing Britain's dollar gap and in making her self-sufficient in the supply of this vital material.

Permits for Oil Prospecting Still Pending in Egypt

Cairo—Administration changes and the inevitable red tape have delayed the granting of 385 permits for the search for oil in the Sinai peniasula and the castern and western desserts on both sides of the Nile in Egypt.

Demands for permits were made as far back as 1948 and after being examined by several parliamentary subcommissions, they came up for a vote in Parliament. But before voting, Parliament's term of office ended.

The new Parliament has gone through the same procedure of passing the demands from subcommission to subcommission. The Senate Commerce Commission has now approved the demands and prospectors may soon get their permits.

Meanwhile, the Standard Oil of Egypt, which has presented \$4; demands for prospecting in various parts of the country, has announced its withdrawal from all activity because of delays and difficulties imposed by the authorities.

The Anglo-Egyptian Oilfields (Shell) has asked 20 permits. Soconv-Vacuum, 41 permits; Societe Generale Francaise du Petrole, 52 permits; and Societe Nationale Egyptienne du Petrole, 107 permits. The remaining of the 388 demands were asked by minor local companies.

Shell Oil Co. has announced plans for exploiting the oil wells in Ras Matarma in October, which is the beginning of the season in desert oil prospecting. American machinery is expected to arrive by that time.

Egyptian technicians say the Ras

Matarma area on the Red Sea might be rich in uranium deposits.

New Suez Refineries Will Handle Egypt's Oil Needs

Caire—Dr. Abu Zeid Bey, director of Mines and Quarries Department at the Ministry of Commerce and Industry, announced that he had reached an agreement with American firms for the construction of new refineries at Suez and the improvement of present ones.

of present ones.

When work on the new plants ends in 18 months, the state-owned refineries will produce 1,300,000 tons of oil annually, 900,000 tons more than the present 400,000. The government expects to spend about \$2,-337,000, on these projects.

337,000 on these projects.

Together with the Shell refineries, which produce 2,000,000 tons annually. Egypt's total oil output will be 3,300,000 tons, which is considered sufficient for this country's present proofs.

Canadian Firm to Build Nylon Salt Plant

Ottawa—Plans for the construction at Kingston, Ont., of a plant to manufacture nylon salt, which hitherto has been imported from the United States, are announced by the Canadian Industries Ltd.

The new plant, which will be constructed adjacent to the company's nylon plant in that Canadian city, will cost approximately \$500,000 and is expected to be in operation by early summer of 1951.

Its basic task will be to combine the chemical solutions used to manufacture nylon and its entire output will be used for the manufacture of yarn and staple fiber in nylon plant itself.

Montecatini Plans Ammonium Unit at Lodi

Rome—Montecatini Co., Milan, has requested \$7,500,000 in Marshall Aid funds to purchase material for a large synthetic ammonia and fertilizer plant it proposes to build at Lodi.

The factory will use methane gas from the Po valley as a raw material. Present plans are to produce about 180 metric tons of synthetic ammonia a day, at low cost. Of this output, 45 tons would be prepared for agricultural purposes. The remaining 135 tons will go to other Montecatini plants.

Apart from the \$7,500,000 of ECA (Continued)

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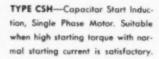








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TYPE DN—Direct Current, Splash proof.

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machinery, about 7,000,000,000 lire's worth of other equipment will be required.

Brazil May Sell War-Built Aluminum Unit

Rio de Janeiro-Sale of a war-built aluminum smelter at Ouro Preto in the state of Minas Gerais to a Canadian Industrial group is reported under consideration. The plant is owned by Cia. Eletro-Quimica S.A., founded during the war by Rene Gianetti, now Brazil's secretary of ag-

The Canadian group desires to buy the company outright by taking up all the 100,000 shares issued. These have a par value of \$10 and a current market value estimated at about \$40 per share, making the deal worth \$4 millions if consummated.

Norway Pushes Its Chemical **Expansion Plans**

Oslo-The nitrogen industry is now geared to produce 150,000 tons annually in Norway compared with less than 90,000 tons in 1948. A new superphosphate plant belonging to the Norske Zinkkompani has been completed and is now producing.

The urea plant of Norsk Hydro is under construction and production is planned for later in the year, while the Odda Smelteverk is extending its production of carbide. The mineral oil refinery at Vallo, destroyed during the war, is now being rebuilt and should be in operation within a year.

Dutch Get Continuous Soap Process From Sharples

Amsterdam - Dobbelman's Soap factory in Nymegen is the first in Europe to apply the continuous centrifugal soap process installation of Sharples Co., Philadelphia. Acquisition of the installation has been made possible by Marshall aid.

Red China Plans Paper Pulp Unit at Chinkiang

Shanghai-Representatives of the East China Industrial Department were sent recently to Chinkiang to arrange for the establishment of paper pulp factory, according to a report from Shanghai. This factory, when established, will be the first of its kind in the East China area.

Between 40 and 50 percent of the paper consumed in East China is im-(Continued)



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ported. Rushes and salt, which are cheap and plentiful in the Chinkiang area, will be used in the preparation of paper pulp at the new factory.

Amazon Oil Well-Rio de Janeiro-Drilling of the first oil well in the Amazon region will get under way shortly with American equipment. The National Petroleum Council has announced the rig is in place in the interior behind the river port of Cameta, on the Rio Tocantins. Six months has been allocated for the first test drill. If results are negative the rig will be shifted to other spots in the same areapossibly even onto the island of Marajo at the mouth of the Amazon-where preliminary tests have indicated the presence of petroleum

Styrene Copolymers-London-More than two years ago the Berger group companies began to market decorative finishes which incorporate styrene copolymers. They have been successful, and large quantities are being used. Coming: immediate marketing of a range of products for use in the field of industrial finishing. A white stove enamel is claimed to have a high resistance to fruit juices, rancid fat, milk acids and alkalis, and will not turn yellow under fluorescent lighting. Styrene copolymers are also being developed for use in the finishing of leather which the group claims will revolutionize the finishing process now being used by the makers of shoes, handbags and similar articles.

Hardening oils—Ottawa—Provincial Government of Newfoundland has decided, as eastern Canada's largest marine oil producer, to set up without delay a hardening plant for treatment of these oils. Oils produced throughout eastern Canada, in the proposed lant, will be hydrogenated, homogenized, bleached and hardened into high quality edible oils. Construction will be started soon and a modern plant designed by European engineers in collaboration with important United States interests.

Pipeline for Samia—Ottawa—Eusquehanna Pipe Line Co., an affiliate of Sun Oil Co., will build a 125-mi. petroleum products pipeline from Sun Oil Co.'s Toledo, Ohio, refinery to Samia, Ont., known as "Canada's chemical valley." The line will carry liquefied gases to Polymer Corp. for use in synthetic rubber production.



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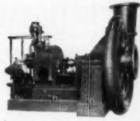
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TO LEAK OR CORRODE



The Corresion Forum

MORGAN M. HOOVER, Assistant Editor

Construction Materials in the Paper Industry Part I - - Stock Handling

Part I of a symposium in which materials of construction are evaluated for various services in the paper industry. Parts II, III, and IV will be concerned with bleaching, acid pulping, and alkaline pulping respectively.

Lead

KEMPTON H. ROLL, Lead Industries Association, New York, N. Y.

One of the important chemicals utilized in the paper industry and, more particularly, in stock handling, is alum. Papermaker's alum is aluminum sulphate, $Al_v(SO_*)$, 14.5 H_{*}O, a chemical which is corrosive to practically all of the common materials of construction with the exception of lead and its alloys, antimonial lead and tellurium lead. It is used either in dry form or as a liquid solution 40 to 50 percent concentration at about 35 deg. Be (liquid alum).

Alum is introduced in the stock beater or Jordan, or both, to produce coagulation and fibre coating. It is added along with a sizing agent consisting of either a soap made from saponifying rosin with alkali or a wax emulsion. Alum precipitates the size so that a gelatinous film is deposited on the fibre. After water of hydration is removed, the paper produced has a hardened surface that resists penetration by liquids. Alum is also used to neutralize alkalimity of pulp and water, to help pigment and filler retention and to reduce pitch and sticking. Raw water is treated in the filter plant with alum to remove turbidity and color. In the pigment plant it is used with lime to make

Lead has for many years and continues to be used in both the manufacture of alum as well as the handling of the finished product in storage and in use. Upon contact with lead, alum immediately forms a thin protective film consisting essentially of lead sulphate. It is this impenetrable and strongly adherent film which successfully prevents any further reaction with the lead. It is important to note

that after a very brief exposure to alum all corrosive action ceases. This assures retention of adequate thickness since lead corrodes uniformly over its entire exposed surface and not by localized pitting. Furthermore this assures complete freedom from the introduction of any harmful products of corrosion into the pulp stock. This latter advantage is particularly significant in the making of fine paper where absolute freedom from many chemical impurities is imperative.

HOW AND WHERE LEAD IS USED

Lead is used wherever liquid alum is encountered alone in (1) storage vessels, (2) conveying lines, (3) feed tanks and (4) measuring boxes.

Examining each of the above applications individually, storage vessels are lined with sheet lead. Vessel dimensions depend entirely upon the alum consumption of the particular plant and may be of lead-lined vessels constructed of concrete, brick, wood or steel. Another type of construction may consist of a skeleton steel framework supporting sheet lead. Brick or concrete tanks are first lined with to 1 in. asbestos sheet to protect the lead from abrasion and any effects of "green" concrete. Lead linings may vary in thickness from 8 to 12 lb. (# to # in.). For storage purposes where severe temperature fluctuations are not normally involved and where the vessels are not more than 10 ft. high supporting straps for the lead are seldom employed. The lead sheet is merely anchored around the top edge and hung over into the vessel in such a manner that the weight is supported by the lip and the bottom.

Alum conveying lines are of lead pipe whose size again depends upon the volume of alum being handled: 1½ in. with ½ in. wall to 3 in. lead pipe with ½ in. wall is commonly used. Over long spans it is almost universal practice to lay the pipe in angle iron or channel iron supports. Cast solid lead valves and pumps or lead-lined valves and pumps may be used to control the alum flow. Joints between pipe sections may be of the Van Stone



Liquid alum flows through this lead-lined measuring tank and lead pipe on its way to the beater.

type or "split joints" welded (burned) together by a properly qualified lead

From storage the alum is usually pumped through lead pipe to an auxiliary storage or feed tank located at the high point of the beater room. A float switch is sometimes installed to control the pump automatically to maintain proper alum level. A typical 500-gal. capacity tank is constructed of steel loose-lined with 8-lb. sheet lead. From the feed tank the alum flows by gravity through lead pipe to the measuring boxes.

Lead measuring boxes are used to furnish measured amounts of alum to the stock and are often suspended above each beater. One system, and probably the oldest, is to make the liquid alum directly in the measuring box by dissolving dry lump or powdered alum in water heated to 120-140 deg. F. The dry alum is lowered in a perforated wooden basket into the lead box containing the hot water where it remains until all of the alum is dissolved. Boxes may be emptied by either gravity feed directly to the beater or by steam jet siphon. A box for this purpose may consist of a wooden frame 2 × 2 × 2 ft. lined

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CORROSION FORUM, cont. . .

with 8-lb. lead. All of the seams are welded (burned) using burning bar of the same composition as the lining which may be chemical lead or antimonial lead.

Newer systems such as the one illustrated use liquid alum at the outset and thus entirely climinate the necessity for handling and dissolving dry alum. A typical mill receives the liquid alum delivered to the plant by tank truck through lead pipe and stores it in an 18,000-gal. 10-lb. sheet lead-lined reservoir. From here it is pumped through 3 in. lead pipe to a 500 gal. 10-lb. lead-lined feed tank located above the beater room; the alum flows through 2 in. lead pipe to 10-lb. lead lined measuring tanks and thence directly to each beater. No problems due to alum crystallization at any stage in the system have arisen in any of the mills investigated. This method of handling alum apparently offers sufficient advantage in economy and efficiency over dry alum methods to convert a number of paper mills into installing new liquid alum equipment

Ferric sulphate may be used as an alum substitute for sizing in the beater or as a water coagulant to remove turbidity and color from raw water in the filter plant. Lead is specified wherever ferric sulphate solution is encountered because this chemical is not only acid but also is oxidizing.

Sulphuric acid is another chemical used occasionally in stock handling which, of course, requires lead for corrosion protection. Sulphuric acid is used for wire souring, parchmentizing and pH adjustment.

Another application of lead in stock handling is for covering agitator shafts found in stock chests and "knotters." Agitator blades are made of cast iron which is sufficiently resistant to the acid sulphite stock (about pH of 5) but too brittle and too expensive to be cast into shafts; therefore the shaft are made of steel. But since acid stock rapidly attacks steel it has been necessary to cover the shaft itself with 4 to 6 lb, lead to protect and preserve it. Typical shafts are 3 to 4 in. in diameter and 20 to 30 ft. long.

Because of the abrasion involved, the vessels themselves are usually constructed entirely of acid-resistant brick. When a steel shell is lined with brick it is customary to first line the steel with a sheet of lead to prevent attack of the steel by acid seepage through the brick.

RUBBER vs. stock handling was squeezed out this mouth to meet space limits. It will appear next month. For stock preparation and handling wherever alum is used, lead has found extensive and increasing application. Employed chiefly for its excellent resistance to the corrosive attack of alum, lead is also used for other reasons. It has proven to be one of the easiest materials to keep clean; it gives extremely long service; it can be repaired in place.

The latter characteristic is especially important for when repairs are necessary they may be easily accomplished with a minimum of expense and shutdown time. In addition, lead is not valueless after its useful service life or obsolescence of the equipment; it may always be salvaged at the highest return of any of the common corrosion resistant materials.

Monel, Nickel, Inconel and Ni-Resist

H. O. TEEPLE, International Nickel Co., New York, N. Y.

Many materials of construction have been used for stock handling in the past, some have proved to be satisfactory and others have not. The modern trend appears to be toward those materials which possess certain favorable characteristics some of which are good strength, ease of fabrication and erection, availability in desirable sizes and forms, good resistance to corrosion and an initial cost which can be economically instified.

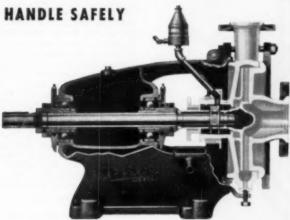
Monel, nickel, Inconel and Ni-Resist are materials of construction which possess many of these favorable characteristics desired for stock handling. Of these materials, Monel and Ni-Resist are the most widely used. Nickel, generally speaking, has no appreciable advantage over Monel from the standpoint of corrosion resistance and, consequently, its use is limited to some extent because of its slightly higher initial cost. In some cases, however, the use of nickel in the form of plated equipment will offer economical advantages.

Inconel finds its primary application in slotted screen plates. Its resistance to corrosion by paper stocks is quite high, of the order of 0.0001 ipy, or less. Its resistance to slot wear is also quite high, which is an important characteristic. In addition, service life records indicate Inconel possesses a high degree of resistance to fatigue, superior to other materials commonly used for slotted screen plates.

Ni-Resist is used for pumps, valve and cylinder spiders all the way through the stock handling operation. Ni-Resist is superior to cast iron in (Continued)

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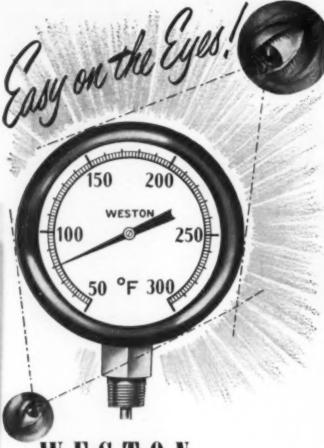
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CORROSION FORUM, cont.

corrosion resistance and is comparable to or better than that of the com-

monly used cast bronzes.

Monel, by virtue of its many favorable characteristics desirable for stock handling finds wide usage in the paper industry. In the following discussion of practical applications of Monel, corrosion data will be shown illus-trating the usefulness of Monel. Data will also be shown, when available, for nickel, Inconel and Ni-Resist for comparison and information purposes.

Monel has been used extensively in the past in diffusers and blow pits in the alkaline pulping industry. In recent years, since brown stock washers have largely replaced diffusers, Monel has been widely used for these stock washers. The resistance of Monel to corrosion by the alkaline liquors together with its strength and availability in useful forms have accounted for its popularity for stock washers. That Monel is suitable for brown stock washer construction, Tables I, II, and III are illustrative.

Table I-Corrosion of Primary Sulphate Brown Stock Washer Head Box

Plant test for 32 days, stock at 190 deg. F.

	In. Fer Ye
Monel	0.0005
Niekel	0.0034
Inconel	< 0.0001
Ni-Resist	0.0014

Table II-Corrosion of Secondary Sulphate Brown Stock Washer Head Box

Plant test for 32 days, stock at 135 deg. F.

	In,	Per 1	Ü
Monel	. < 0	.0001	
Nickel	. < 0	0001	
Inconel	<0	.0001	
Ni-Reniet		.0010	

Table III-Corrosion of Primary Soda Brown Stock Washer Head Box

Plant test for 158 days, sinck at 180 dec. F.

	In. Per Yr.
Monel	< 0.0001
Ni-Regist	0.0025

Screening is done to remove the small percentages of coarse and irregular particles of stock as well as to remove foreign substances. This is frequently done by rotating cylindrical screens. That Monel is useful is illustrated by Tables IV, V, and VI.

Table IV-Corrosion of Groundwood Knotter Screen

Plant test for 61 days, stock at 103 deg. F.

	In. Per Yr.
Monel	0.0008
Niekel	0.0004
Inconel	< 0.0001

Table V-Corrosion of Sulphite Head Box to Knotter Screens

Plant test for 76 days, stock at 44 deg. F., pH 4.3

													In.	Por	Ye
Monei													0	.001	7
Niekol													. 0	.007	30
Incomel													<0	.000	0
Ni-Rosiat													0	OUG	2

Table VI-Corrosion of Soda Screening Head Box

Monel		0	0100
Nickel			.0010
Inconel		×0	.0001
Ni-Resist		0	.0023

Monel is also quite suitable for siffers, fine screens, deckers and thickeners. In connection with the latter, usually of cylinder mold construction, Monel has found considerable application for structural rods, winding wire, backing and facing wires. Corrosion data illustrating the usefulness of Monel appear in Tables VII and VIII.

Table VII-Corrosion by Groundwood and Sulphite Stock Thickener Filtrate

Plant test for 69 days, stock at 115 dog. F., pH 4.6

													In.	For Y	gr.
Monel													0	0025	
Nickel.											-		-0	0002	
Inconel													< 0	CHURT	

Table VIII-Corrosion of Bleached Sulphite Riffler Headbox

Plant tost for 97 days, stock at 68 deg. F., pH 7.0

																In.	Per	Yr
Monel																< 0	.000	1
Niokai .																< 0	.000	l .
Inconsi																< 0	.000	Ł
Ni-Remit	Ł															0	003	8

The use of Monel in beater applications, such as beater bars and bed plates, has proved to be quite extensive and corrosion data illustrating this use appear in Tables IX and X. (Continued)

Table IX-Corrosion of Sulphite Stock Beater Chest

Plant test for 84 days, stock at 63 deg. F., pH 4.7

	In. Per Yr.
Monel	0.0009
Nickel	
Inconel	
Ni-Resist	0.0054

Table X-Corrosion of Sulphate Stock Beater Chest

| Plant test for 10t days, stock at 46 deg. F., pH 7.0 | In. Per Yr. | Monel | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |



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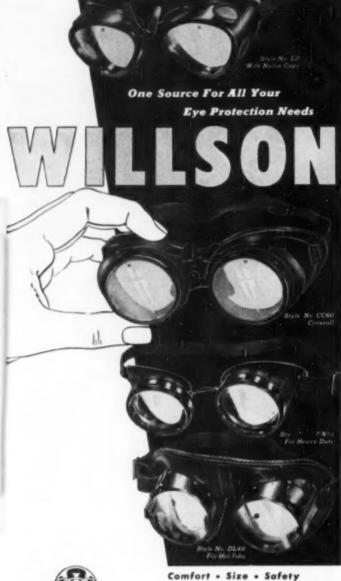
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CORROSION FORUM, CORt. . .

In the course of further stock refining, Monel has been used ex-tensively for jordan filings. The corro-sion data in Table XI illustrate these applications,

Table XI-Corrosion of Jordan Stock Chest

Plant to	out for	76	d	in;	PB,	k	min	el	k.	8	ü	1	64	4	fo	g	. F.,	pH 6.	ø
																	In.	Per Y	ř.,
Monel.																	0	0002	
Nickel.																	0	.0002	
Inconel																	< 0	.0001	

As in the case of beaters, jordan filling materials must provide adequate resistance to corrosion and possess the hardness and toughness necessary to refine and beat the stock properly. Monel jordan fillings and beater bars are available in hardness ranges from 165 Brinell to over 275. Where maximum mechanical proper-ties are required heat treatable "K" Monel is the preferred material.

In paper machine applications, Monel over the course of many years has proved itself to be quite useful for many of the paper machine parts, such as headbox linings, slices, aprons, flow eveners, saveall trays, suction boxes, breast and other roll coverings, table rolls, wire return and guide rolls. The high strength of Monel together with its ease of fabrication and corrosion resistance are responsible for these important applications of Monel.

In addition to Monel, nickel in the form of plated equipment has found much use for table rolls, wire return and guide rolls. Nickel plating also has been used to reclaim worn rolls by applying a plate of from 20 - 50 mils of nickel.

Duranickel, a nickel alloy hardenable by heat treatment, has been used for machine shaker springs. This alloy combines high mechanical strength and spring properties together with good resistance to corrosion, all of which are desirable for paper machine shaker springs.

Corrosion data illustrating the usefulness of Monel and nickel for parts of paper machines is shown in Tables XII, XIII, and XIV.

Table XII-Corrosion of Paper Machine Parts Handling Groundwood and Sulphite (Newsprint)

Plant test for 299 days, stock at 95 deg. F., in white

														In.	Per 1	ř
Monel.														0	nung	1
A TANK TO														- 0	Panes	
necould														0	CRASS	

Dependable Products Since 1870

*T.M. Reg. U.S. Pat. Off.

Table XIII-Corrosion of Savealls, Sulphite Pulp

Plant test for 54 days, stock at 62 deg. P., phi 4.7

	In.	Per	YE
Monsi		.000	
Nickel	0	.000	
Isoonel	<0	.006	10

Table XIV-Corrosion of Machine Headbox, Sulphate Pulp

Plant test for 43 days, stock at 90 deg. F., pH 6.8

														In.	Pur	Y
Monel.	6													0	.000	12
Ninksi.		,													.000	
Incomel										,				< 0	.000	12.

In addition to those applications listed above, Monel has found particular use as stock lines. The many favorable characteristics of Monel are quite desirable stock line material, assuring long life and product purity.

Monel doctor blades are used in many mills and in particular "K" Monel because of the outstanding mechanical properties developed through heat treatment. "K" Monel doctor blades operate with minimum regrinding, absence of metallic beads along the blade edge, absence of a roughened blade surface due to corrosion, absence of rusting which can cause damage to the roll surface and work equally well at the wet or dry end of the paper machine.

Other important applications of Monel are shower pipes, nozzles and other miscellaneous uses requiring good resistance to corrosion by paper stock and white waters.

In conclusion it is to be noted that Monel, nickel, Inconel and Ni-Resist find many uses in the pulp and paper industry. Service life data indicate that these useful materials are easily justified in many instances.

Worthite

W. E. PRATT, Worthington Pump and Machinery Corp., Harrison, N. J.

Paper stock pumps over a long period of years were usually standard cast iron or cast iron standard-fitted (bronze impeller, rings and sleeves). In recent years there has been a trend to reduce the heavy metal impurities by using more corrosion resisting materials in some or all of the stock pumps. All bronze stock pumps are becoming more common in the sulphite mills. The higher cost of chrome-nickel stainless or nickelchrome-moly alloys does not seem to be justified.

In the Kraft pulp mills the highly alkaline solutions prohibit the use of bronzes and the chrome-nickel or nickel-chrome-moly alloys are being used to an increasing extent. The (Continued)



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paper stock pumps used for transferring stock from blow tank to washers is the most corrosive condition, except in bleaching. Pumps have been used with cast iron and nickel-cast iron casings with stainless internal parts. A few plants have gone to Ni-Resist Type I casings with suitable stainless trim. One mill has gone to all stainless stock pumps.

These moves towards more corrosion-resisting pumps are all pointed towards reducing metal contamination in the stock in order to improve the grade of paper. While Worthite is a high-alloy stainless steel (24 percent nickel, 20 percent chromium, 3 percent moly, with small amounts of silicon, copper and manganese) the added corrosion resistance at around 15 percent higher cost than 18/8 stainless, has not yet been justified in these applications for stock handling.

Worthite pumps are used very widely in the handling of acid sulphite liquors and in the recovery processes in the alkaline pulping mills. These conomical applications will be discussed later under the proper subjects.

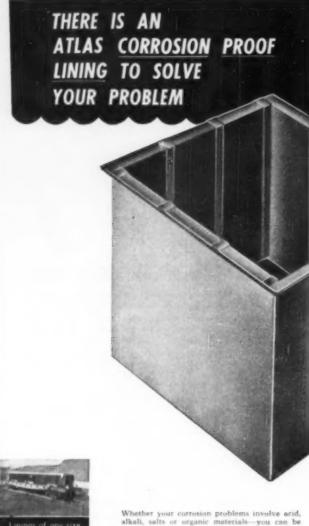
Cements

RAYMOND B. SEYMOUR, The Atlas Mineral Products Co., Mertztown, Pa.

Litharge-glycerol cements have been used whenever possible for the joining of tile throughout the entire paper industry but is being gradually replaced by more modern cements. Tile in concrete blow tanks have been joined with both phenolic and furfuryl alcohol cements. In standard construction, tile are first joined with Portland cement which is partly raked out and acidified before pointing with the resin cement.

However, the introduction of an extremely fast setting furfuryl alcohol cement has made possible a new technique in which the leading edge of the tile is joined with the furfuryl alcohol cement before the addition of Portland cement to the back joint. Stainless steel bolts are built into the floor to support a stainless steel false

Tile linings are also used for storage chests, beaters, blending chests, white water tanks, machine chests and wire pits. The cement used will depend upon the pH of the stock. Silicate cements have been used throughout the paper industry but are not satisfactory for neutral or alkaline solutions. Sulphur cements are suitable for calcium bisulphite at temperatures below 200 deg. F. Furfuryl alcohol cements are more resistant than phenolic cements to alkaline condi-



Whether your corrosion problems involve acid, alkali, salts or organic materials—you can be sure that Atlas can supply the specific lining for the job. There is no universal lining but one of Atlas' ATLASTAVONS will solve the problem. ATLASTAVON 1—Resistant to all acids, many solvents and salts.

ATLASTAVON 10—Resistant to all alkalies, salts and non-oxidizing acids (except concentrated hydrochloric acid), and all phatic solvents.

ATLASTAVON 20—Resistant to all acids and alkalies.

ATLASTAVON 30-Resistant to most acids, alkalies, salts and many solvents.

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tions and are being more favorably considered for new installations and the repair of present equipment. As the new fast-setting furfuryl alcohol cements and associated construction techniques become standard, considerable improvement in paper industry construction may be expected.

Iron and Steel

ARTHUR E. MAY, Moore and White Co., Philadelphia, Pa. ALBERT W. SPITZ, Reiter Engineering Co., Philadelphia, Pa.

Cast iron and carbon steel have been used extensively in the stock handling systems of paper mills. Some corrosion, however, does occur, also discolorization of the stock; the newer mills have in many places substituted more resistant materials. Difficulties encountered from rust and slime in pipe lines have tended to minimize the use of steel piping.

Cast iron suffaces, unmachined, have an inherent corrosion resistance that is widely used since it is still generally the most economical material of construction. The major equipment in the stock handling system and the use of iron and steel in its construction are herewith listed:

Pulpers and Breaker-beaters.
Cast iron bowls and tubs are satisfactory. Tile and concrete are also used.

Storage Chests. Steel chests have been used but the contamination is usually objectionable. Cast iron, tile and concrete are satisfactory.

 Stock and White Water Pumps. Cast iron, bronze-fitted pumps are used. Cast iron bases are sometimes preferred to steel.

Refining Equipment. High carbon steel cutting elements with wood spacers have been used; more resistant alloys are now also widely employed, particularly for the better papers.
 Screening and Stock Cleaning

 Screening and Stock Cleaning Equipment. Iron and steel have been largely replaced with other materials of superior corrosion resistance.

6. Head Boxes. Cast iron has been used on small machines, clad or coated steel boxes are extensively used at present on large, high speed machines. Wood is also satisfactory.

 Fourdrinier Section. Cast iron is used for framework, bearing brackets and other structural parts. Unprotected steel is usually unsatisfactory.

8. Piping. Steel pipe with cast iron fittings has been extensively used; however, scaling, pitting and slime formation frequently occur. Lined steel pipe has proven satisfactory as has pipe of stainless steel, non-ferrous metals and asbestos cement.

-End

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Try Hysol

If handling corrosive chemicals is a problem to you... investigate
Hysol 6000. This outstanding new material... which has many properties no other material offers... can be fabricated by ordinary metal working machinery. Odorless, tasteless and non-toxic, it will not break down or cloud in the presence of corrosive chemicals.

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 - Impervious to
 - Odoriess, tasteless, non-toxic.



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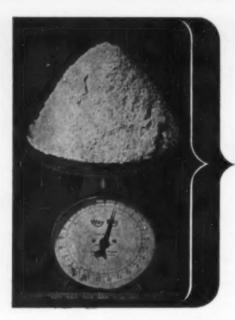


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LIGHT WEIGHT ... a useful and costsaving property of DICALITE MINERAL FILLERS

DICALITE MINERAL FILLERS are produced from diatomaceous silica. They are amorphous in character (not crystalline), comparatively soft and friable, and free from gritty matter. Following data give the range of properties of the many grades of Dicalite available for filler use.

Colors	gray white, buff, white
Refractive Inde	x1.40 to 1.48
Particle Size	from 10% retained on 150
	to trace on 325 mesh screen
Weight (loose)	8 to 13 lbs. cu. ft.
Surface Area	20,000 to 100,000 sq. ft. per lb.
Porosity	approximately 90%
Melting Point	approximately 2900° Fahr.

STRUCTURE-Digtom structure of the individual particles is responsible for many of the desirable filler properties of Dicalite. Instead of being approximately spherical, each par-ticle is irregular with a predominance of acicular and elongated shapes. Such particles form an interlacing "strawpile" pattern that reinforces and strengthens—an effect particularly noticeable in paint films, asphalt mixes, molded goods, etc.

LIGHT WEIGHT-This factor is often utilized to reduce shipping costs and for general bulking. The loose weight of Dicalite filler materials varies from 7 to 13 pounds per cubic foot according to grade. The apparent specific gravity is 0.112 to 0.21; actual specific gravity is 2.00 to 2.35.

VAST SURFACE AREA -- Because of the diatom structure mentioned above, Dicalite fillers have a tremendous surface area per unit of weight. Each particle is irregular in shape and porous as well. This property is of decided benefit when the material is used as a source of silica, as a diluent for insecticides, as a carrier for catalysts, etc.

HEAT RESISTANCE—Dicalite materials have a melting point of approximately 2900° F. In addition, their high porosity makes them very poor conductors of heat. Thus, Dicalite not only improves heat resistance but reduces the heat conductivity of a material or product of which it is a part.

CHEMICAL INERTNESS—Composed of silicon dioxide (SiO₂), Dicalite filler materials are chemically inert, and can be used in compounding without special formulation in regard to reactions.

POROSITY AND ABSORPTIVENESS-Porosity or voids of Dicalite fillers will average 90%. Depending on the liquid and grade of material, absorptiveness will vary from 120% to 300% of the weight of the Dicalite. Wetability of all materials is excellent.

PARTICLE SIZE-Materials may be supplied for special purposes with virtually any particle size. The filler grades regularly supplied range as shown at the left. Predominating particle size of most grades is between 2 and 6 microns.

A Dicalite Engineer will be glad to discuss your specific application. Call or write any Dicalite office.

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DICALITE MINERAL FILLERS



MAN OF THE MONTH W. Alec Jordan

Alec Jordan is the new editor of Chemical Industries. Since joining the staff in 1943 as Canadian correspondent he has been news editor, managing editor and, most recently, business manager. His appointment as editor comes at a time when the magazine is changing publishers-from the MacLean-Hunter Publishing Corp. to the McGraw-Hill Publishing Co.

A 1936 graduate in chemistry from McMaster University, he began his career in the research and development depart-ment of the Norton Co., Niagara Falls, Ont. There he contributed to early work on refractory cements and the development of electrical insulation for sheath-type heating elements. Four years later he became assistant chief chemist for McKinnon Industries Division, General Motors Co. Ltd. of Canada at St. Catherines, Ont. From there he went to the Soden organization, Montreal sales representative for American, British and Canadian chemical manufacturers. He was responsible for technical service. During the year before he joined Chemical Industries, he was eastern man-

Lester R. Sagar has been appointed process manager of Dearborn Chemical Co., Chicago. He will supervise production planning and the development of process equipment. Previously he has been a consultant with Booz, Allen & Hamilton.

Robert J. Speer, principal chemist on the staff of the Texas Research Foundation at Renner since 1947, has been named head of the radiochemical laboratory of the foundation. Dr. Speer was with the Atomic Energy Commission at Oak Ridge, Tenn., after the war.

ager of Apco Industries, Toronto, manufacturer and distributor of petroleum solvents, alcohols, textile chemicals and

He was born in 1914 in Bryn Mawr, Southwales, England. His family moved to Canada when he was six and he grew up in the somewhat rural environs of Hamilton, Ont. The outdoor life there led him to a fondness and facility for golf and horseback riding. He blames the latter accomplishment for his slight limp, mostly noticeable after I've been sitting for a while-not to be confused in any way with rheumatism." While out riding one day in Niagara Falls, the horse sud denly took a side road. Mr. Jordan didn't The result was a badly torn ligament, for Mr. Jordan that is.

Let's get something straightened out right here. Mr. Jordan's first name is "just plain Alec-please." It seems that many years and considerable pains have been spent trying to convince the world of this. With the exception of a few loyal converts, his morning mail continues to be respectfully addressed to one Mr. Alexander Jordan. Furthermore, the Scottish element in his native Britain and in Canada always insisted on "shortening" it to

With Mrs. Jordan and 21 year old Eric Ellis, he now lives in Croton-on-Hudson, N. Y. On many winter evenings he sits in the kitchen with last week's newspapers spread out around him and carves animals out of wood. In summer, however, his spare time is almost exclusively devoted to trimming a 180-ft, privet hedge-just one continuous (le. He has worked up a burning ambition to acquire an electric shearer. He also keeps tropical fish; they

require no attention, they just grow.
Since joining Chemical Industries, and subsequently coming to this country in 1945, he has been active in the American Chemical Society, the Chemists Club of New York and the Chemical Institute of Canada.

Wilson F. Brown has been named interim professor of chemical engineering and interim research engineer for the engineering and industrial experiment station of the University of Florida.

E. F. Hickson, chief of the paint, varnish and lacquer section of the National Bureau of Standards, has retired after 31 years' service.

G. Harvey Benham has been named supervisor of biochemistry at Armour Research Foundation, Illinois Institute of Technology, Chicago.

Raymond H. Hartigan has been appointed manager of the laboratory section of the central research department of Koppers Co., Pitts-burgh. He was formerly a fellow at the Mellon Institute of Industrial Research. Gordon Black has been made assistant manager of the development section of the research department. Peter W. Sherwood has been made manager of the engineering branch of the development section.

W. H. Engels has retired from his post as associate director of research and development for Merck & Co., Rahway, N. J. He has been with the company 39 years and will continue in a consulting capacity.

H. R. McCleary has been appointed sectional director, application re-search department, for the Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J. He has been on the Calco physical chemical research staff since 1941.



H. R. McCleary J. D. Leonard



Jackson D. Leonard has opened a consulting business specializing in cost reduction. Since receiving his chemical engineering degree from Pennsylvania State College in 1937 he has been employed by the Gen-eral Chemical Division, Allied Chemical & Dye Corp. and then by E. I. du Pont de Nemours & Co.

Ralph M. Hunter, manager of Dow Chemical Co.'s electrochemical division, has received the honorary doctor of engineering degree from Case Institute of Technology, Cleveland. He took his B.S. degree in chemical engineering at Case in 1918 after which he joined Dow's chlorine department. He has since been active in research and development work

(Continued)

NAMES IN THE NEWS, COUR. . .





J. C. H. Wendes

ndes C. F. Ruebensaal

John C. H. Wendes has been appointed production manager of the Naugatuck Chemical Division, United States Rubber Co. He will supervise all manufacturing and engineering operations in the synthetic rubber plants in Naugatuck, Conn., Port Neches, Tex., and Borger, Tex., and in the vinyl resin plant at Painesville, Ohio, and the chemical plant at Naugatuck, Clayton F. Ruebensaal has been appointed technical director of plastics and resins for the Naugatuck. Chemical Division.

Harold C, R. Carlson has been elected chairman of the American Society of Testing Materials, New York district council. He heads his own firm of design consultants known as the Carlson Co., New York. George O. Hiers of the National Lead Co. has been elected first vice chairman of the council; S. R. Doner, Raybestos-Manhattan, Inc., has been elected second vice chairman.

August H. Homever has been elected a director of Mallinekrodt Chemical Works, St. Louis. He is associate director of research and has been with the company for 17 years.

Joy E. Beanblowom has been made manager of development for Hooker Electrochemical Co., Niagara Falls, N. Y. With Hooker since 1929, he has been responsible for the development of many intermediates for the manufacture of development of the manufacture of development of develop

Robert J. Roth has joined the staff of the Madison, Wis., laboratories of Bjorksten Research Laboratories. Earle A. Weilmuenster has joined the staff as section leader in organic synthesis. Stepben Marshall has also been added to the staff H. Roswell Jones has been appointed to the synthetic fuels and chemicals department, chemical plants division of Blaw Knox Construction Co., Pittsburgh. He will be engaged mainly in the design of plants to produce finished refined products from Fischer-Tropsch, Oxo, and Oxyl syntheses.

Orlo E. Brown, Jr., research metallurgist, has joined the staff of the West Coast research and development laboratory of Robertshaw-Fulton Controls Co. in Los Angeles.

D. Gray Weaver, formerly in the prodnet development laboratory of the Acheson Colloids Corp., Port Huron, Mich., has been transferred to the Newark office where he will assist in the co-ordinating of technical and research problems. Alfred R. Mullis has been appointed manager of the Gulf Coast district office of the petroleum chemicals division of E. l. du Pont de Nemours & Co. A 1938 Rice Institute graduate majoring in chemical engineering, he has been with du Pont de Nemours in their Gulf Coast district since 1947.

Bradley Dewey, Jr., has been appointed manager of the Cryovae division of Dewey & Almy Chemical Co., Cambridge, Mass. He will have charge of sales, manufacturing and research in the division which produces tubing and bags for packing frozen foods.

Hamilton Merrill, a vice president and director of Manning, Maxwell & Moore, Inc., has been elected president of the company.

Edwin O, Burstow. This story begins during the '80s in a suburb of Cleveland where our central character, then a very young boy, lived. He is Edwin O, Barstow, now a vice president and director of Dow Chemical Co., Midland, Mich. A stu-



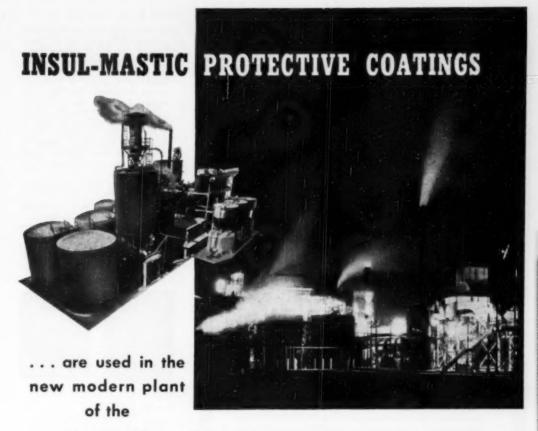
E. O. Barstow

dent at Case School of Applied Science, Cleveland, came regularly to the Barstow home to make a little extra money doing odd jobs—enter Herbert H. Dow. At Case, Dow was working out his bromine manufacturing process which he subsequently put to work making products from the rich underground brine abounding in the environs of Midland, Mich. There emerged the Dow Chemical Co. When the firm was three years old, Dow, who had been his own chemist, found he needed an assistant. He had kept in contact with the Barstows and in 1900 he hired young Edwin, just graduated from Case.

Now celebrating his golden anniversary with Dow Chemical Co., Edwin Barstow's first 17 years with the company were intimately tied up with its growth, both in the development of new processes for the manufacture of other chemical products and in the design of the plants and their operation. He contributed to the operation of processes for making sulphur chloride, carbon tetrachloride and chloroform, and to Dow's bi-polar electrolytic chlorine cell. He worked up methods for making lead arsenate, sodium benzoate and for the separation of calcium chloride and magnesium chloride from Midland brine. In World War I he was responsible for the design, construction and operation of a plant to manufacture synthetic phenol by the sulphonation process.

Perhaps his greatest achievement was the development of the electrolytic process for production of magnesium, to which he devoted over twenty years starting in 1916. Dow's ability to expand quickly to produce huge quantities of magnesium in response to the demand caused by World War II was largely due to Edwin Barstow. In addition to his own ideas and inven-tions in the magnesium field, he constantly stimulated the creative efforts of members of his organization. Under his leadership the difficult problem of the dehydration of magnesium chloride was successfully reduced to an efficient commercial process idapted to large scale operation. The electrolytic cell was expanded from a mere toy to a unit of 60,000 amp. capacity. The field of alloys was explored to develop those best suited for commercial use and all the various operating techniques were discovered for melting, casting and me-chanically working the alloys, improving their corrosion resistance and providing protective coatings. Every stage of development from the small scale laboratory experiment to the engineering of full scale operating plants was under his personal direction and supervision.

The project to multiply producing ca-pacity of magnesium with the use of sea water as the primary source of raw material crowned years of endeavor to create a magnesium industry in this country. The design of Dow's original installation at Freeport, Tex., involved numerous prob-lems of chemistry and engineering which had not theretofore been encountered in the production of magnesium from the more concentrated inland brines. It was designed, engineered, built and put into successful operation in less than one year. It became the model upon which subsequent units, in the government plants operated by Dow and others, were based. Ed-win O. Barstow was responsible in greatest measure for the choice of process steps and their integration into that original plant.



Coosa River Newsprint Company

Maintenance will be at a minimum in the new Coosa River Newsprint Plant. In this modern pulp and paper mill, tanks, evaporators, ducts, pipes and other vessels have been coated with INSUL-MASTIC either over metal or over insulation.

This quality coating gives the highest degree of resistance against weather and other corrosive agents such as salt cake and other chemicals used in the manufacture of pulp.

Quality in INSUL-MASTIC is due in part to the plentiful Gilsonite content. This thoroughly saturated hydrocarbon is practically inert. It resists combining with other chemicals or being displaced by them.

Quality is increased by a large percentage of carefully chosen and tested flake Mica, the most durable of fillers, as shown by the United States Bureau of Standards. This tough mineral adds many years to the life of INSUL-MASTIC and the vessels which it protects.

Quality is assured by blending and homogenizing these and other durable minerals according to a patented formula which cannot be duplicated.

For your own corrosion problems, we have engineers located in principal cities, ready to help you.



FOR GREATEST ECONOMY OF SPACE AND MANPOWER



A quick hook-on to a pallet, basket or standard sling and the load is whisked away—cutting across occupied floor space—straight to the spot where you want it.

It's smart, and thrifty to use "through the air" transportation as widely as you can in plants and warehouses. Compare this method for overall cost, efficiency, maintenance and safety before you allow other means of transfer to overlap the service that is best performed by cranes and hoists!

Let the Shepard Niles specialist break your problem down for you—he's experienced, skillful and he has the maximum number of sizes and types in his product line.



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NAMES IN THE NEWS, CONT. . .

Harry W. Faust has been appointed assistant director of the St. Louis research department, organic chemicals division, Monsanto Chemical Co. He graduated from the University of Michigan in 1929 and joined Monsanto. Eli Perry and Robert J. Schatz have been appointed assistant directors of research at the plastics division in Springfield, Mass.; Robert W. Jones, Stuart H. Rider and Roland J. Bourke have been appointed group leaders in the research department.

Arnold Belchetz, formerly chief technologist for Shell Petroleum Corpand later head of the new processes department of M. W. Kellogg Co., is now practicing as a consultant to the petroleum and chemical industries. At one time he was director of research and development for Stauffer Chemical Co. His offices are in Larchmont, N. Y.



(1)

A. Belchetz

L. P. Seyb

- L. P Seyb, since 1942 a chemist and group leader in the research department of Diamond Alkali Co., Cleveland, has been named manager of research. He first came to Diamond from the Phillips Petroleum Co., Bartlesville, Okla. He succeeds J. E. Underwood who has become a research consultant for the company. Previous to his six years with Diamond, Mr. Underwood had been manager of research and development for Pennsylvania Salt Mfg.
- E. W. R. Steacie, director, division of chemistry at National Research Council of Canada, has been made vice president of the council. He will continue in his former post which he has held since 1939.
- Wilbur J. Wilson, chemist, has joined the staff of Battelle Institute, Columbus, Ohio, where he will conduct research on nonferrous metals.
- R. W. Thomas, manager of the research and development department of Phillips Petroleum Co., Bartlesville, Okla., has been elected vice president of research and develop-

ment. He will supervise research and patent activities and chemical manufacturing, development and sales. He succeeds G. G. Oberfell who has retired. Mr. Oberfell established the research and development department for Phillips after joining the company in 1925.

Edward B. Conway has been elected a director of National Starch Products Inc. He is a director of F. Eberstadt & Co., Chemical Fund, Inc., Elliott Co. and Hastings Mfg. Co.

G. E. P. Smith, Jr. of the Firestone Tire & Rubber Co., has been elected chairman of the Akron section of the American Chemical Society. G. H. Stempel, Jr. of the General Tire & Rubber Co. has been elected vice chairman.

George W. Vinal has retired as chief of the electrochemistry section of the National Bureau of Standards. He is known for his work in the development and perfection of the silver voltameter and the standard cell, which serve as standards for the international ampere and volt.

Joseph W. Britton, Donald D. Hall, Floyd C. Peterson and William H. Williams have been appointed to membership to the Midland plant operating board of Dow Chemical Co. Mr. Britton and Mr. Williams are production managers; Mr. Hall is the company's production coordinator. Mr. Peterson, who recently was appointed assistant to the general manager is continuing his regular duties as production manager of the cellulose products division.

Irwin Master, chemist, formerly with the Pittsburgh Consolidated Coal Co., and William A. Deskin, physical chemist, have joined the chemical division of technical command, Army Chemical Center, Md.

Francis J. Curtis, vice president and director of Monsanto Chemical Co. and secretary of the company's executive committee, has been appointed director of industrial preparedness with headquarters in Washington, D. C. Mr. Curtis served as president of the AIChE in 1949. Philip R. Tarr, European technical representative, has been appointed assistant director.

Robert S. Herwig has been appointed vice president in charge of production for Belco Industrial Equipment Division, Paterson, N. J. In his 17 (Continued)



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NAMES IN THE NEWS, CORT. . .

years with the company, he has worked on protective coatings of all types and on high capacity granular ion exchange for sea water purification.

Merle E. Wendt, in charge of vinyl production development service and technical sales service on adhesives and latices for Goodyear Tin & Rubber Co., Akron, has been elevated to assistant manager of the chemical products development division. He is succeeded by Kermith K. Fligor.





M. E. Wendt

R. J. Grasley

Robert J. Grasley has been appointed head of the technical staff of Resin Industries, Santa Barbara, Calif. He will direct all development work for the company and will serve as liaison between the engineering and sales departments. Formerly he was in charge of development for Welding Engineers, Inc.

Edwin F. Pike, chemical engineer consultant, has joined Wallace Clark & Co., international management consulting firm of New York.

James W. Lucas has been made superintendent of Victor Chemical Works' Mt. Pleasant, Tenn., plant. He has been with Victor since 1936, most recently as assistant superintendent of the Mt. Pleasant plant.

Lee N. Haugen has been made manager of the refining division of Cities Service Oil Co., Bartlesville, Okla. He was formerly general superintendent.

Douglas A. Spencer has been appointed deputy managing director of Kodak Ltd., London. Since 1945 he has been technical adviser to the chairman of the board.

Don C. Oskin has been made director of district sales for Westvaco Chemical Division, Food Machinery and Chemical Corp., New York. James R. Harris, Jr., formerly Mr. Oskin's assistant as division sales manager in charge of the phos-



phate sales division, succeeds him in the post.

George J. King has been appointed director of sales of the industrial chemicals department, Atlas Powder Co., Wilmington. He has been transferred from the New York office where he has been branch manager. J. V. Miller has been made director of a newly created sales development division; C. D. Pratt has been appointed director of the technical division.

Pell W. Foster Jr. has been appointed vice president in charge of the newly created equipment division of Foster Wheeler Corp., New York. Mr. Foster, a director and vice president in charge of production since 1946, will continue as active head of the production and procurement departments.

Donald R. A. Jones has been appointed manager of the branch office at Los Angeles of the Moore Products Co. Prior to this he was a consulting engineer and an industrial gas engineer with the Southern California Gas Co.

W. L. Nelson has been named technical service and development manager for Dow Chemical Co.'s Great Western Division. He will be in charge of all development work on chemicals, agriculturals and plastics.

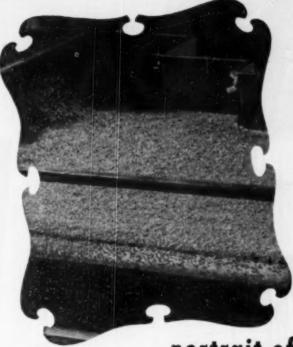
Robert E. T. McMahon has joined the sales department of Jefferson Chemical Co., New York. He has recently received his chemical engineering degree from Clarkson College of Technology.

Irvin H. Jones, manager of the patent section, research department of Koppers Co., Pittsburgh, since 1944, has been made international development manager.

Richard A. Weppner has been appointed sales engineer for corrosion resistant chemical construction materials in Delaware, Maryland, Virginia and parts of West Virginia and New Jersev for Atlas Mineral Products Co., Mertztown, Pa. Philip E. Bea.ns has been appointed for eastern Pennsylvania, western New York and parts of New Jersey; W. A. Streaker for lower Michigan, eastern Indiana and part of Ohio.

George V. Taylor has been made director of sales development for Spencer Chemical Co., Kansas City, Mo. Heretofore, he has been director of market research.

(Continued)



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BS&B SAFETY HEADS...What They Are...How You Can Use Them:

The BS&B SAFETY HEAD consists of three principal parts . . . a pre-formed metal rupture disc and two specially designed holding flanges. Correct element resistant metals are used in Jabrication of the rupture is reached. Instantly a fully unrestricted escape disc, which bursts when a pre-determined pressure for gases and liquids takes place. No other relief device acts so quickly as the \$568 SAFETY HEAD.



Viscous material washes against the rupture disc as it flows through the curved channel indicated by the shaded pertions of the diagram. material moves on through the passage if no undue pressure rise occurs. However, H passage becomes blocked, such material will tend to solidify quickly, causing a dangerous rupture disc bursts and the pressure is given pressure rise. In that case, the SAFETY HEAD a fully unrestricted opening. 176

might contaminate internal of the valve. Investigate

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2

corrosive materials

ture disc bursting pressure outlet will stop leakage until rup-

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where 10 01 parts

A SAFETY HEAD of the relief

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Il relief valve, used for primary

MINIMUM BURSTING PRESSURE OF SAFETY HEAD RUPTURE DISC

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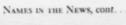
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Robert Vignolo has been appointed Pacific Coast sales manager for Baker Castor Oil Co., New York. He was formerly with Turco Products as assistant to the president and technical director.

George J. Tombak, since 1934 a technical salesman in the New York office of E. I. du Pont de Nemour's fine chemicals division in New York, has been transferred to Wilmington as a technical adviser and consultant to aromatics customers.

Charles G. Whinfrey, Jr., has been made technical sales representative of the agricultural chemicals department of Pennsylvania Salt Mfg. Co., Philadelphia. He has been assigned the northeastern territory.

Donald E. Hope succeeds him as sales control assistant.

Lynn J. Brady has joined the staff of Grasselli Works Division, General Aniline and Film Corp. He will supervise the company's Linden, N. J., plant. Until assuming this post he was supervisor of technical service of the Air Reduction Co., New York.

John S. Wilson has been appointed sales engineer for agricultural chemicals, calcium chloride in southwestern Ontario for Dow Chemical of Canada Ltd. (Toronto).

R. A. Dittbrenner has been appointed eastern representative for the Carboline Co. of St. Louis, Mo.

William Godley has been appointed manager of contract sales, George E. Smith, manager of the air heater division, and Edward R. Clark, manager of the automatic oil burner division, for Peabody Engineering Corp., New York.

John B. Taylor, Jr. has been appointed assistant director of research at the Ethyl Corp. laboratories in Detroit, to direct research on automotive and aviation products.

Lee O. Witzenburg has been appointed general sales manager of the Cleveland Worm and Gear Co. and its subsidiary, the Farval Corp.

William C, Stringfellow has been assigned to the Dallas branch office of General Controls, Glendale, Calif.; H. G. Sudler has been assigned to New York; Earnest F. Bruegel to Philadelphia and R. Roedder to Los Angeles.

(Continued)



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This unmatched proficiency in the application of low-cost SO2. may be of immense value to you if your processes call for a chemical of its varied capacities. It may work wonders with your production costs and the quality of your product. We'd like to cooperate with you in finding out. Send for our free SO₂ booklet. VIRGINIA SMELTING COMPANY. Box 21, West Norfolk, Virginia.

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NAMES IN THE NEWS, CORT. . .

Charles H. Gallaway, sales manager of the safety products division, American Optical Co., Southbridge, Mass., has been elected president of the Industrial Safety Equipment Association.

Edward B. Nitchie has been appointed director of manufacturing of the Durkee Famous Foods Division of the Glidden Co., Cleveland,

Charles F. Woods has been named valve division sales manager for the southwest region by Minneapolis-Honeywell Regulator Co. Edward J. Byrne succeeds him as industrial manager of the Dallas branch. Howard W. Griesbach has been appointed industrial manager of the Milwaukee branch.

Frank W. Leitner, formerly an engineer with the Graniteville Co., has been appointed a sales engineer for the Reliance Electric & Engineering Co. He will cover North and South Carolina.

Vernon R. Childress has joined the marketing division of General Electric's chemical department in Pittsfield. Mass. He was formerly manager of plastics sales for O'Sullivan Rubber Co., Winchester, Va.

Chester H. Butterfield, vice president of Manning, Maxwell & Moore, Inc., has been named vice president in charge of the Consolidated-Ashcroft-Hancock Division.

J. A. Flobeck has joined the New York-New England branch office staff of Diamond Alkali Co., New York. He was formerly with Sessions-Gifford Co., Providence, R. I., where he had been sales manager.

A. W. Sawyer has been appointed assistant to the vice president of Lin-coln Electric Co., Cleveland.

S. W. Collins has been made sales representative for the states of Oklahoma and Kansas for Alloy Steel Products Co., Linden, N. J.

Karl J. Learey, district manager at Atlanta, Ga. for the general products division of Goodyear Tire & Rubber Co., has been named manager of Airfoam sales. His headquarters will be in Akron.

Barclay E. Mackinnon has been appointed general sales manager of New York Quinine & Chemical Works. He has been with the company since 1933.

- Willard R. Barrett, formerly vice president and general manager of the Hoosier Cardinal Corp., Evansville, Ind., has been named sales manager for the plastics division of General Electric Co. in Pittsfield, Mass.
- Ron Merritt has been appointed field sales agent for the instrument division of Allen B. Du Mont Laboratories, Clifton, N. J. He will cover the northwestern territory.
- James T. Potter has been appointed representative in the states of North and South Carolina for Graver Water Conditioning Co., New
- W. Jack Develin has been appointed consulting engineer to head engineering and sales of the solid steel belting department of Metalsmiths division of Orange Roller Bearing Co. He had previously been manager of the conveyor division of Sandvik Steel Inc.
- Paul W. Holstein has been elected president of the Weinman Pump Mfg. Co., Cleveland. He has been with the company 40 years.
- R. A. Kramer has been elected vice president in charge of sales for Evans Chemetics, Inc., New York. He has been the company's sales manager.
- Karl L. Rothermund, Jr., has been appointed assistant sales manager for the Columbia Cement Division of Pittsburgh Plate Glass Co., Pittsburgh.
- Alfred D. Jenss has been made district manager in the Cincinnati office for Ampco Metal, Inc., Milwankee.
- Joe Gavle has been made manager of the Davison Chemical Corp.'s fertilizer plant at New Albany, Ind.

OBITUARIES

- William C. Bainbridge, 63, of H. Kohnstamm & Co., New York, died July 6. He was known for his work on color chemistry.
- Andrew Czapak, 36, chief engineer of Volco Brass & Copper Co., Kenilworth, N. J., died in his home in Elizabeth, N. J., July 8.
- C. Richard Woodfill, 38, manager of Commercial Solvents Corp.'s industrial chemicals division, died in New York, July 24. He had been with the company since 1933.



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Completely electronic and instantaneous in operation. No moving parts. Maintains output voltage to within ±0.1 volts of nominal for line voltage variations; to within ±0.15 volts for any load current change — or for any load power factor change from 0.5 lagging to 0.9 leading. Waveform distortion never exceeds 3%. Available in a wide range of capacities.

STABILINE TYPE EM (above right)

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INDUSTRIAL NOTES

NEW COMPANIES

- Del Jack Co., Beverly Hills, Calif., to provide equipment and supplies to chemical, food, fertilizer, metallurgical, pharmaceutical and allied industries on the West Coast. The company is headed by Delbert E. Jaci
- F. W. Du Bois Co., Detroit, to specialize in sales engineering of industrial and municipal water purification and water treatment. The organization has been founded by F. W. Du Bois, formerly of Du Bois-Webb Sales, Detroit.
- Ferroxcube Corp. of America, New York, to manufacture a new ferromagnetic ferrite, particularly useful as a core material in high frequency coils and transformers. The new organization is a joint venture of Sprague Electric Co. of North Adams, Mass., and Philips Industries, Inc., Hartford, Conn.
- Farris Staeon Corp., Palisades Park, N. J., to manufacture the regulator formerly made by the Edison Stacon Regulating Valve Division of Thomas A. Edison, Inc. The new company is a result of the purchase of the Edison division.

NEW LINES

- Atlas Powder Co., Wilmington, has acquired the line of activated carbons of the Darco Corp. As a result of a merger the latter corporation, formerly an Atlas subsidiary, will be the Darco Department.
- Wilson Rubber Co., Canton, Ohio, has been granted exclusive license to manufacture solvent-proof protective gloves made of compar by the process developed and used over the last 13 years by the Resistoflex Corp., Belleville, N. J.
- Pittsburgh Coke & Chemical Co., has begun commercial production of synthetic organic chemicals, consisting of a variety of plasticizers used in the compounding of resins, rubber and paint.
- Air Reduction Sales Co., New York, has been appointed national distributor for the welding industry of a recently introduced lightweight torch which gives an instant heat at 2200 deg. F. and permits immediate

- application of a hot flame for soldering joints, loosening nuts etc.
- Vitro Mfg. Co. has acquired contracts primarily in the field of atomic energy development through the purchase of the Kellex Corp. from M. W. Kellogg Co.
- Babcock & Wilcox Tube Co., Beaver Falls, Pa., has increased the size range of its seamless steel tubing. It can now produce hot finished tubing in outside diameters up to 94 in. and cold drawn tubing in outside diameters up to 84 in.
- Fisher Scientific Co., Pittsburgh, has acquired the complete stocks, tools, dies and full rights to the petroleum equipment developed by the C. J. Tagliabue Co., Newark, N. J.
- Orange Roller Bearing Co.'s Metalsmiths Division, Orange, N. J., has announced a complete engineering and fabricating service covering stainless steel endless belts for conveyors.
- Henry A. Gardner Laboratory, Inc., Bethesda, Md., has acquired manufacturing and sales rights to a new light-weight vest pocket size dry film thickness gage.

NEW FACILITIES

- Atlantic Steel Co., Atlanta, Ga.—A product engineering department headed by F. A. Teeple, Jr. The move is in response to the growth of metal-working industries throughout the South and to increased demand for diversification of its own products.
- Wheelco Instruments Co., Chicago— A sales office in Grand Rapids Mich., which will serve the whole state except for Detroit. R. P. Campbell heads the office.
- Graver Tank & Mfg. Co., East Chicago, Ind.—A district sales office in Cincinnati headed by John R. O'Connor.
- Lear, Inc., Grand Rapids, Mich.—Increased space in its main building in Grand Rapids bringing its main plant area to 180,600 sq. ft.
- Synvar Corp., Wilmington—A distribution center in Valdosta, Ga., to (Continued)

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READ MACHINERY DIVISION of the Standard Stoker Company, Inc. YORE 1, PENNSYLVANIA INDUSTRIAL NOTES, CONT. . .

make shipments of low and high solid content resin to plywood and furniture manufacturers in the Southern states.

Sharp & Dohme, Inc., Philadelphia— A new building to house its New Orleans branch. It will be located at 909 Jefferson Davis Pkwy, and will be ready for occupancy about October I.

Dow Chemical Co., Midland, Mich.—A division to better coordinate aromatic chemical research with customer needs as a result of the purchase of Bush Aromatics, Inc., of New York. The new division will be directed by Arthur Behr who has been in charge of aromatic research at Dow for the past ten years.

Hammond Iron Works, Warren, P.a.

—Sixteen acres of new plant at
Bristol, Pa., which almost doubles
the steel tank, stack, standpipe, etc.,
fabricating capacity of the company.

Eastman Kodak Co., Rochester, N. Y.

—A chemistry department comprised of several chemistry sections at Kodak Research Laboratory. William O. Kenyon has been placed in charge.

NEW LOCATIONS

Infico Inc.. Chicago, has moved its research, development and engineering division, as well as its general offices, to Tucson, Ariz. They will occupy temporary quarters at 2750 South Twelfth Ave, while a new building is under construction. The company has retained its Chicago office.

Henry Levine & Son Inc., electroplating consultants, has moved its Forest Hills office and laboratory to 153 East 26th St., New York.

Blaw-Knox Co. has moved its Washington, D. C., office to Suite 209, 1000 Vermont Ave., N. W.

John W. Masury & Son, paint and varnish manufacturer, has moved to Baltimore. The company was formerly located in Brooklyn, N. Y.

Industrial Filter & Pump Mfg. Co. has moved to 5900 Ogden Ave... Chicago.

NEW REPRESENTATIVES

Lee Rubber & Tire Corp.'s Republic Rubber Division has appointed the Southern Marine & Supply Co., Savannah, Ga., and the Wetzel Equipment Agency, Salt Lake City, Utah, as its distributors.

Dow Chemical Co., Midland, Mich., has appointed Magnus, Mabee & Reynolds, Inc. as distributors of propylene glycol in the New York area.

Better Finishes and Coatings, Inc., has appointed Kraft Chemical Co., Chicago, as Midwest sales representatives for its plating grade chromic acid flake.

Insul-Mastic Corp. of America, Pittsburgh, Pa., has appointed H. S. Chaffee Co., Buffalo, N. Y., and W. F. Magann, Portsmouth, Va. its representatives.

Dampney Co. of America, Hyde Park, Boston, has appointed three new agents to handle its line of specialized protective coatings for the maintenance of metal. They are: Boiler Supply Co., Nashville, Tenn., to cover central Tennessee; R. E. Mundy Co., Roanoke, Va., to cover central Virginia and southern West Virginia; Consultores y Abastecedores Industriales to cover Mexico.

Murray Mfg. Co., Wausau, Wis., has appointed Charles F. Childress Co., Indianapolis, its representative for unit heaters in parts of Indiana, Ohio and Kentucky.

Eriez Mfg. Co., Erie, Pa., manufacturer of magnetic equipment, has appointed the Ponsford-Moos Equipment Co., El Paso, Tex., its exclusive sales representative in Panama, Costa Rica, Nicaragua, El Salvador, Honduras and British Honduras.

Graver Water Conditioning Co., New York, has appointed Evans L. Shuff & Associates as its representative for the Atlanta, Ga., area.

NEW NAMES

Burgess-Parr Co., Freeport, Ill., has changed its name to the Illium Corp. because of the close association of the company with its principal product, Illium, a corrosion resistant alloy.

National Technical Laboratories has changed its name to Beckman Instruments, Inc. to associate the corporate name more closely with the trademark of its principal products. of costly equipment with ... SARAN RUBBER TANK LINING

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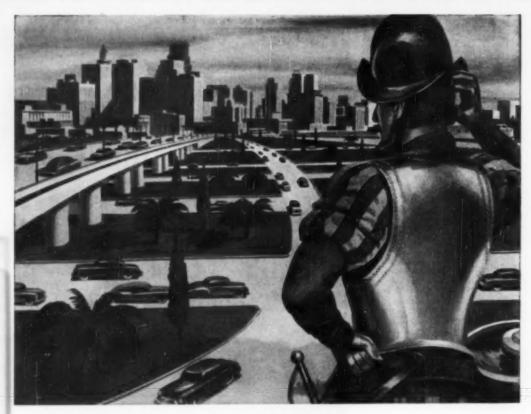
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Quotes, Extracts and Digests

MORGAN M. HOOVER, Assistant Editor

Opportunities in Market Research

Robert B. Wittenberg

One of top management's major jobs is to look ahead and provide for the future of the business.

Market research, with its knowledge of product history, and industrial trends, should be in excellent position to provide management with the forward look—impartially. It should interpret the economic trend and tell management "when to fish" and when to cut bait"—when the climate is right for expansion, and when it should pull in its neck.

The sum of success in a business is the total of the market outlook for each individual product. One product may be in a rising or increasing market, another may be declining—good market research should tell management when pressure should be applied or released, or when to reduce sales pressure on buggy whips and put pressure on gasoline.

Market research may contribute substantially to all phases of business, yet few of our chemical producers are really using the market research department as it should be used to its tullest extent.

Now, let's see where market research can be used. Since the sales department is vitally concerned with markets, let's look at it first:

Market research should be used to analyze the markets for present, as well as new products—determine the total market, potential market, available market and its geographic locations quantitatively. Before any sales program can be made, management must know where markets are, how big they are and approximately what share of the market can be secured.

Market research should then be used to determine the proper territorial limits based on the available market and practical traveling limitations. This factual analysis of sales territories is the real basis for assigning territories to salesmen.

Periodically, sales territories must be re-analyzed—as new customers are found, and new products, added—it frequently happens that salesmen are



Robert B. Wittenberg, Assistant to the President of J. T. Baker Chemical Co., is a pioneer in market research.

spread too thin Market research should be used for this job every few years-otherwise, sales territories will get out of balance.

Along with this reappraisal of territories should go the determination of sales quotas. Too often, management may decide, perhaps arbitrarily, that sales must be increased 20 percent in each territory this year. Suppose the business simply is not there?—and, in many territories, it isn't—what then? Too often the salesman feels that management is unfair—and he may be right. Market research should do this iob.

Market research can and should play an important part in measuring salesmen's performance. Too many times a salesman or sales manager is given credit for increasing business 10 percent—when, in fact, the consumption in his territory may have increased 50 percent. The only true yardsticks for judging sales performance of a salesman, or sales department are (1) What share of the total business is being obtained? (2) What is it costing to get it? Market research must obviously be used to get these facts.

And what about sales forecasts? Today, no business of any consequence can operate efficiently without some idea of what it will sell, how much, and when, and what it will get for its products. The sales forecast in many companies is the beginning of

the annual budget. The preparation of this forecast is again primarily a market research job, serving sales management by doing the grubbing work necessary to set up a real fore-

Now, let's look at market changes and trends. The sales department, if it is doing its job, is spending 100 percent of its time trying to hold old business and secure new. It hasn't the time, or the patience to gather the information that shows trends. It is up to market research, working with national and regional statistics and data to tell the sales department that "demand will increase the next few years in territory A because -"better quit trying to push product X next year, because product Y is replacing it in market preference." Sure, the salesmen will pick up this in-formation in due course, but it may be too late-or the salesman may not realize its significance and may not even bother to report it. His job is to sell goods, not gather economic data.

It is always healthy—and perhaps disillusioning at times, to look at ourselves in the mirror, and see how fat and lazy we have become. It's always healthy for a business to reappraise its competitive position occasionally. Too often a company goes along smugly in the believe that it has 20 percent, 30 percent or 40 percent of the business—until it suddenly finds out that competition has far outstripped it and it is an also ran. Market research should be used every few years to find out just where the business really does stand with respect to competition.

And what about pricing? Market research can do a real job here, particularly in developing pricing policies on new products. The old idea of charging what the traffic will bear may bring the law of diminishing return into play before the new product even has a chance. Too many products have been stunted, and competition invited, by being priced too high initially. Market research should be used in developing a sound price and volume relationship for new products.

Market research can do a bigger job than it is now doing in determining (Continued) customer reaction and preference. A recheck of customers by market research occasionally will bring out many ideas and point out trouble spots that need correcting.

In packaging and labeling of consumer goods, market research can do an outstanding job, if it is given the chance, by finding out what the customer really likes and dishkes.

And what about advertising? Too many times national advertising campaigns have been launched only to fall flat because the company did not have sufficient sales force to follow up the leads opened by advertising. Market research should be used by the advertising manager to guide him in choice and location of media to keep the advertising program on the target. So much for the sales department.

Now, how can market research as-

sist production?

By appraising plant location with respect to market changes. Frequently, management must decide whether to expand production at an existing plant, or build a new operation nearer the market. Market research can develop the information needed to make this decision.

How large should the new plant be? Obviously a large plant with idle capacity is just as bad as one that is too small to develop proper costs. Market Research in its broadest sense is needed here and must work out the best compromise between small plant overhead and idle capacity, based on the market the plant will

Rare is the plant that can quickly and economically increase or decrease production to meet changing markets. Hence, market research is needed to provide short range sales forecast which can be used for setting produc-

tion schedules.

Inventories, likewise, are sensitive to market changes. Hence, market research can do a real job in providing dependable sales forecasts which can be used to coordinate production and inventories-permitting production to operate at a fairly fixed rate, and using inventories to take up the variations. This is applicable also to raw material inventories which should vary according to plant needs, and in turn with the sales forecast.

Obviously, changes in production rates are reflected in purchasing. Hence, market research may aid the purchasing department materially by keeping it constantly advised of trends in raw material markets, keeping it informed of changing sales trends,

and relating purchasing to the sales forecast.

On hand, there appears to be little relationship between market research and traffic department operations. Yet, in many instances, market research has a ded materially in developing freight rate structures for new products, appraising the effect of rate changes on markets, and providing factual information and even testifying at rate making hearings.

Up to this point, nothing has been said about the use of market research in connection with the research and development department. Yet, this is the work to which most market research is confined at present. It is understandable that market research should have had its first start in connection with the development of new products. However, it is questionable whether, even in this field, market research is being fully utilized.

Before one cent is spent on technical laboratory or pilot plant research, a preliminary market research study should be made primarily to determine whether the project is of immediate commercial significance. One of the problems confronting the technical director is keeping his research program balanced between short range, long range and academic re-

The first study, made quickly and in scant detail, should be made to determine whether the project fits the research program. If it is then decided to undertake research on the project, market research should then determine the market limitations and cost limits within which the project he kept. This involves a little more detailed market research to determine approximately how much material may be sold, and the net revenue which can be derived at the plant. This sets the scale of operations, determines roughly how large the final plant should be, and the approximate cost which must be met if the prodnets is to be sold profitably.

At the same time quality limits should be determined, for the guidance of the development work. These are governed by what the consuming trade really needs. There is little sense in trying to sell gold-plated tack hammers, for the plating does not improve the utility of the product. Likewise, there is no logic in trying to sell a Ford in a market requiring Cadillacs. These quality limitations should be determined early in the program as they may have serious effect upon the choice of the processes used, and the ultimate operating costs.

Ouce the decision has been made

to go ahead with research and process development, market research should coordinate closely with the technical program. It should continue to provide whatever market data is needed, and at the same time, maintain continuous appraisal of the research work to keep it on the beam financially. Too many times, in developing processes, technical research in secking new and better methods, may tend to employ uneconomic methods. Market research must continually appraise the program from the profit standpoint, and run up the danger signal when technical research appears to be heading into an unlikely channel.

You may say that this economic appraisal is not market research, and to some extent this is true. However, the market research man, being in touch with all phases of business, is usually better able to make an impar-

tial appraisal of this sort.

As process development proceeds, and the project becomes of interest commercially, attention then must be directed to packages and labels. While ICC regulations may indicate the type of package to use, it is up to market research to find out what the customer wants. If the consumer uses the material in 50 lb. batches, there is little use in trying to sell him larger or smaller units. Within the limitations of the ICC regulations, therefore, market research should determine what container will best satisfy customer needs.

Labeling also enters this picture. The regulations of the Food & Drug Act and of the Caustic Poisons Act. as well as state regulations may have some bearing. While expert advice on the information to be placed on labels should be sought, market research should again determine what the cus-

tomer really needs.

As part of the research and development project, market research should determine where the new plant, if erected, should be built. Too many times new units are placed in an existing plant, for reasons of inertia, when market location would indicate some other site would be more economical. Thus, unless the plant is properly located initially, a permanent handicap of transportation charges may be built into it.

As the new project moves along toward completion, market research should advise management on the sales methods to be used, and the personnel required to launch the new product. If the new product is related to the present line the present sales force may be adequate. If, how-

(Continued)

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Assistant Director of Central Research Minnesota Mining & Manufacturing Co.

QED, cont. . .

ever, the product is invading new fields, entirely different methods and fechniques may be needed.

Market research, in connection with this, should also prepare the preliminary sales budget for new products and provide management with some idea of what selling costs may be. Many a product shows an apparently wide margin between cost and selling price, but actually may be unprofitable when selling costs are deducted from revenue.

Along with this preliminary budget, market research should advise management on the pricing policy to be followed. Too many times a new product has been held back by over-pricing, and unnecessary competition invited. Market research should suggest the price levels to be used at each stage of expansion.

Robert B. Wittenberg, J. T. Baker Chemical Co., before the Pitth Annual Meeting, Chemical Market Research Association, New York, June 8, 1980.

AIR POLLUTION

. . . Regulation

Richard F. Hansen

To a large degree, the "law" relating to air pollution is the creation of administrative officials. Opportunity for court review of their determinations, whether or not expressly provided by law, is not an entirely satisfactory safeguard. They possess the power to harrass and impose burdens and to coerce or fatigue into compliance.

Fortunately for industry, the enforcement agencies have, on the whole, been lenient with offenders and considerate of their problems. My own experience in this regard has been generally favorable and I have found most of the officials to be reasonable men who recognize that the arbitrary exercise of their powers would, in many cases, be even more harmful to the community than the discomfort or inconvenience resulting from atmospheric pollution.

The reason why the legislatures have chosen to deal with this subject only

... DEFICIENCIES?

"Many of the younger generation have been taught the theory of communism, capitalism, aocialism, and abstract theories of economics, but have not been taught much about the application of economics or the relationship of capitalism to their own daily lives."

CHARLES SAWYER
Secretary of Commerce

in general terms and to delegate broad authority to administrative agencies to determine what is and what is not permissible is that the problem is so complex.

First, the number of possible pollutants and combinations of pollutants is practically unlimited and increases from day to day as new processes are developed:

Second, there are as yet no recognized standards of permissible pollution for the various contaminants except smoke, soot and fly ash;

Third, until the standards are established covering allowable concentrations at the ground level (i.e., the point of exposure), no reasonable standards can be established for the permissible rate of discharge at the stack:

Fourth, the development of methods and procedures to identify offending pollutants and measure their concentrations would be vital to the administration of a statute prescribing specific limits:

Fifth, what may be a nuisance at one time or place may not be at all offensive to the public at other times and places.

Experience indicates that industry tends to locate where it can enjoy the greatest freedom of operation and that by careful selection of its plant sites, it probably will be able to minimize regulation in the field of air pollution. But, as James Otis remarked in 1764. "Men cannot live apart or independent of each other . . . and yet cannot live together without contests. These contests require some arbitrator to determine them." And as long as the passions of the men refuse to conform to the dictates of reason and justice. we may expect more stringent laws and more severe penalties.

In fact, the handwriting is already on the wall for all who have eyes to see. We have all witnessed more times than we wish to recall the election of politicians on the basis of their promises to eliminate almost every alleged source of human discomfort. It is a popular theme and there is no reason to assume that atmospheric contamination is any exception. Whether the kind or amount of pollu
(Continued)



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QED, cont. . .

tion in any given area is in fact harmful is beside the point. These promises will get votes.

Richard F. Hansen, Allied Chemioni and Dye Corp., before the Industrial Hygiene Foundation of America, Inc., Pittsburgh, Nov. 18, 1949.

AIR POLLUTION

. . . Sensible Approach

H. B. Lammers

Now that the public has a better appreciation of the complexities of present day air pollution it must be re-educated to approve the employment of highly skilled administrators and personnel, budgeting of adequate funds, and equipment. Smoke was the problem of yesterday. Air pollution is the present-day problem. The solution to the latter is much more difficult and expensive. A sensible approach to the air pollution problem must be based on: (1) Facts-not hearsay. (2) More attention to the three E's-Engineering, Equipment, Education. (3) Economic factors must be given consideration-eventually it is you and I who pay for the entire program. (4) Greater emphasis on the administrator rather than on legislation. Likewise good men cannot be found willing to work for low salaries. Lack of funds and inadequate budgets are the serious drawbacks to air pollution programs. (5) Acceptable standards, which can be used to gauge improvement and to make comparisons with other cities. (6) Differentiate between pollutants considered to be nuisances only and those which are health factors. (7) No program can long succeed or continue if based only on enforcementall programs require public support for the required length of time to obtain proper abatement. (8) combined help to experts in all fields including

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Dn. MERRIL EISENBUD, Director Health and Safety Division AEC New York Operations Office the engineer, chemist, combustion engineer, doctor, economist, city planners, meteorologists and others. This problem cannot and will not be solved by the smoke inspector regardless of the talents he may possess.

H. B. Lammers, Coal Producers Committee for Smoke Abatement, before the Midwest Power Conference, Chicago, April 5-7, 1958.

FUEL-GAS INDUSTRY

. . . Growing Pains

The fuel-gas industry has shown amazing postwar growth. Increased use of natural gas has pushed 1949 consumption about 9 percent ahead of 1948, overbalancing a slight decrease in use of manufactured and mixed gas. In 1949, the industry spent \$940 million on new facilities and expansion; and estimated \$1.8 billion will be spent over the next three years, chiefly for natural-gas facilities. This expansion is accompanied, however, by pressing problems in providing capacity needed for high winter demands and in balancing plant and distribution facilities.

Expanding the distribution system to meet the increased demands for space heating without heavy investment in new mains is a serious problem for some companies, especially with manufactured gas. Manufactured city gas usually refers to "blue water gas" made from oil and coke, to byproduct coke-oven gas, and recently, to enriched gas made from reformed hydrocarbons, or to mixtures of these. Such gas has a heating value of about 530 Btu. per cu. ft. The heating value of such mixed gases can be increased to 600 or 660 Btu. to increase distribution capacity some 20 to 25 percent with but little change in the production plant or the consumers' burners. This is done by increasing the proportion of gas from petroleum or gaseous hydrocarbons. With natural gas or a high Btu. gas from petroleum oils, a heating value of approximately 1000 Btu. or higher is achieved. Slower-burning natural gas requires a complete changeover of all outlets, which is costly, but does not begin to compare in capital costs with new gas-making capacity or new mains. Oil gas with a high Btu. content requires less appliance adjustment because of its large component of fast-burning hydrogen.

Space heating uses about 25 percent of all fuel gas and is a rapidly growing outlet. Some companies sell 50 percent or more of their product for this (Continued)



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QED, cont. . .

use. Although gas is still a premium fuel in the East, it is the cheapest fuel in many areas, and its cost is increasing more slowly than that of other fuels. In mid-1949 there were 6.6 million gas space heaters installed, with 700,000 more expected for the past winter. While this is good for total business, it raises the problem of how to provide enough fuel at the lowest possible cost for the winter months, when the demand in some areas may be up from 75 to 90 percent.

One method for meeting the seasonal fluctuations in demand is to liquefy natural gas at -260 deg. F. during the slack season, store the liquid in special tanks much smaller than would be needed for the gas itself, and release it as gas for the win-ter demand. Use of this method in Cleveland in 1942 ended in a disastrous fire and explosion, but the causes have since been judged pre-ventable, and the Federal Power Commission has recently authorized a \$6 million plant to store liquefied natural gas for Chicago. Recent indications are, however, that this plant may not be built. A method similar to liquefaction, but possibly safer, has re-cently been announced. Fuller's earth is used to absorb natural gas at a low temperature, about -250 deg. F. About 200 volumes of gas can be retained on one volume of the fuller's earth. This method is considered to be too costly to be of widespread

Natural gas is sometimes stored underground at high pressure in cylindrical vessels or pipes, but the investment is high for any but small installations. Excellent results have been obtained by pumping the gas for storage into wholly or partially depleted gas fields when a suitable location is available. One company has been using an abandoned gas field since 1930 to store billions of cubic feet of cokeoven gas.

The petroleum fraction known as LPG (liquefied petroleum gas) is liquefied at ordinary temperatures and it low pressure, and hence is easily stored. Many small communities use it exclusively, and others store it to meet peak loads or emergencies. despite the relatively high price of LPG, which limits its use for base loads where natural gas is available. LPG, diluted with air to adjust its heating value and density, may be mixed with manufactured gas to the extent of 15 to 20 percent of the amount distributed. Higher percentages of LPG can be used where the system is capable of handling a higher Btu. gas. LPG can also be reformed

by a catalytic process to provide a gas completely interchangeable with that of almost any gas-making system when

the economics demand.

Cheap residual petroleum oils have long been used with water gas and coke-oven gas in making low Btu. manufactured gas. High Btu. oil gas from these cheap residuals is receiving much attention at present, both as a city gas and as a peak-load or emergency substitute for natural gas because of its higher heating value, the present relationship between oil and coal costs, and the relatively low cost of converting existing water-gas equipment to such use, with considerable increase in its gas-making capacity. In some cases where natural gas has become available to replace manufactured gas, conversion of the old equipment for oil gasification has worked out satisfactorily to take care of the high-cost peak-load periods. The major problem facing every gas company to which natural gas becomes available is whether to convert to natural gas completely, or to convert to a mixed gas of higher Btu. value, with its greater flexibility for peak loads and emergencies. Generally, it is preferable for gas companies manufacturing their own coke to follow the latter course, but otherwise economics favor the use of natural gas. From the long-range point of view, however, coal is expected to be the chief energy source when natural gas and oil reserves are de-pleted. Present developments are directed at obtaining high Btu. gas from coal at low cost.

The problem in the gas industry are far from solved, despite these advances, and in many areas it is still necessary to restrict consumption. Installation of new equipment for space heating may be controlled to keep the peak load at a reasonable lever, with permits granted only as the system can take care of them. Another common procedure, especially with natural gas, is to make industrial contracts for interruptible service, with the object of increasing industrial use during off-peak times. In this case, standby equipment must be available to process oil or LPG when the gas is not available. These restrictive meas-

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(Continued)



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OED, cont. . .

ures are far from universally satisfacfory, however, and the industry is striving to work out economic methods of serving all its customers all the time.

From the June 1960 table of A. D. Little's Industrial Bulletin.

SAFETY

Wise Owls

To become a member of the Wise Owl Club, a worker must submit his smashed or burned goggles as proof that they saved him from partial or complete blindness. If the proof is adequate, he receives a small gold pin which identifies him as a member. This pin serves as a constant reminder to himself and his fellow workers that goggles should be worn at all times while on the job.

The importance of this eye-safety incentive is emphasized by this fact: an estimated 300,000 eye injuries occur each year in U. S. plants-90 percent of which are preventable.

Idea for the club came from Joe Folks, a worker at the St. Louis plant of the American Car and Foundry Co. Over a period of years, he had noticed how many times a worker's goggles prevented a serious eye injury. He suggested to plant safety officials that a club be formed, its membership made up of workers who saved their sight by wearing goggles. Plant officials liked Folks' idea; a survey of the ten ACF plants was made, and 76 candidates were found eligible. That was in 1947. Today, there are 208 ACF employees in the club.

The ACF company, after realizing that the club was a potent eye-safety incentive, turned it over in November 1948 to the National Society so that it could be made available to every safety director in the country. Today there are Wise Owl chapters in 191 industrial plants in 34 states, Hawaii, and Canada. These plants employ a total of over 240,000 workers.

From the National Society for the Pre-

DETERGENTS

. . . Of the Future

A. L. Fox

We may first consider the possibility of a cold-water synthetic detergent. If a synthetic detergent could be made which would be as efficient in cold water as present day ones are in hot, it would find extensive use in laundries and in many households. The home automatic washers of today require larger amounts of hot water than many households can furnish. With automatic washers a cold water detergent would be very welcome. The use of very hot water in laundries has considerable expense attached to it, although it has the value of killing many of the germs on the clothes. It may be predicted that cold-water detergents will be evolved over the next 50 years, which will be very efficient.

Today, far more than half of the housewives use bleach to help them brighten their clothes. Bleach, however, is definitely detrimental to the life of fabrics; consequently it is desirable if something else, not detrimental, can take its place. It is predicted that, in general, synthetic detergents over the next 50 years will be improved sufficiently so that the use of bleach will be absolutely imnecessary.

Many times, clothes are mildewed due to leaving damp wash in the basket. It is not unreasonable to assume that a synthetic detergent will be developed in the future which will have anti-mildewing characteristics, and will therefore command the purchasers' attention.

Synthetic detergents today are used to some extent on woolens. It is not unreasonable to hope for mothproofing agents which may be applied to the fabric from a synthetic detergent, so that sweaters washed in this type of detergent would be mothproofed at the same time. The present moth-proofing agents known have to be applied under strongly acid conditions, and this as well as their high cost has prevented their use in detergents; certainly it may be anticipated that in the next 50 years economical mothproofing compounds will be found which can be used in synthetic detergents, and many manufacturers will wish to add this property to their

We hear much today in the press about the unsanitary conditions in the public washing machines, in stores where automatic washers are rented. Most of this is probably inspired for propaganda purposes, but certainly a germicidal detergent would have much to recommend it. It is confidently predicted that in the future such germicidal action will be added to synthetic detergents. Even today some manufacturers claim such properties. Most cationic compounds have germicidal activity, and it may well be that one of the detergents of the future will be cationic, and germi-

cidal.

One of the properties endowed to fabrics by the textile mills is a soft feel, or "hand." This is done by means



(Continued)

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QED, cont. . .

of certain chemicals which make the fabrics much gentler to the touch. Most of these compounds are cationic, and here again it is possible that cationic agents may find a future in this field. Certainly, synthetic detergents which have this added property will be developed over the next 50 years.

Very recently there has been described a treatment for fabrics, a rinse, which minimizes the soiling of the labric during use, and which causes the removal of soil much more easily after the fabric has become dirty. This treatment was described in a recent release from the Institute of Textile Technology. The present status of this would make it appear that it is too expensive, but it is not unreasonable to believe that a synthetic detergent itself incorporating this property may be developed in the next 50 years. Certainly it would have enormous consumer appeal.

In the next 50 years we may expect to see types of synthetic detergents built for special purposes. Already we have on the market certain synthetics which are especially recommended for automatic washing machines, as they produce low foam, and therefore do not impede the mechanical action of the washers. Many other detergents of this type may be expected, especially as the number of automatic washers in the country become

There is on the horizon an entirely new type of automatic washing machine. Certain investigations are being carried out at various places in the world on the use of ultrasonic waves as the mechanical force for removal of dirt from fabrics. In Australia an ultrasonic washing machine has already been offered to the public; evaluation of this does not show it to be particularly effective, but it is probably a forerunner of more effective types. Certainly new types of detergents will have to be built for such types of washers.

Another boon to the housewife which is rapidly appearing on the American scene is the mechanical dishwasher. It will be necessary to develop synthetic detergents which will be effective in them. At the present time certain inorganic salts are widely used, although there is on the market a very superior product based on a synthetic detergent and still further improvements may be expected.

A. L. Fox, before the 27th annual meeting of the American Institute of Chemists, New York, May 11-12, 1950.

-End



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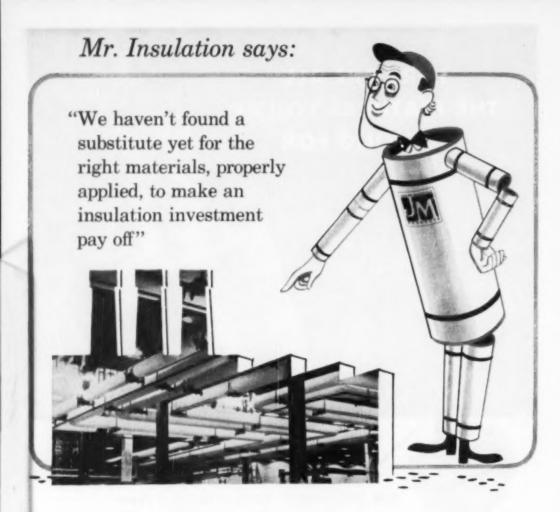
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September 1950—CHEMICAL ENGINEERING

Chemical Engineer's Bookshelf

LESTER B. POPE, Managing Editor

Technical and Economic Data on Chemicals

INDUSTRIAL CHEMICALS. By W. I., Faith, Donald B. Keyes and Ronald L. Clark. John Wiley & Sons, New York. 652 pages. \$8.

Do you remember what I told you last month about a chemical dictionary? During World War I a need begat an idea; the idea begat a book.

The same sequence happened during World War II. Larry Faith and Don Keyes were in Washington with the Office of Production Research and Development of the War Production Board. They often needed quickly certain basic information on industrial chemicals. How made? What was normal yield? Raw materials and amounts? Production and price history? Competing products and processes? Normal use patterns? Normal plant size? Plant cost? Where are the plants? Who makes it?

This basic information—mixed technical and economic data—could be gotten from the literature or a specialist. But that meant a lot of spade work. If such information were available in one volume it would be useful not only to technical men but also to those who bought, sold or used industrial chemicals. So Faith filed the idea as his postwar project. He and Keyes decided that it would be "the kind of a book a vice president should have in his desk so that



W. L. Faith He got a postwar prodding.

he could bone up quickly and impress his staff during conferences."

After the war Faith joined Corn Products Refining Co. and didn't have time to write his book. But he couldn't get the idea out of Keyes' head. They finally agreed that Faith was to go ahead; Keyes would find the necessary assistance. Accordingly, Keyes made arrangements with the late B. R. Armour, president of Heyden Chemical Corp., to have R. L. Clark help. Clark was in the market research group but was reassigned. He

got to work as his full-time job at Heyden in digging up and plotting production and price data, drawing flowsheets and writing process information. He sent this material to Faith, five or six chemicals at a time. Faith filled gaps, rewrote, redrew. Keyes' contribution was that of senior advisor, critic and prodder.

There is quite a demand for current information on industrial chemicals. Your Chemical Engineering editors recognize this. That is why, without knowing what Faith and Keyes and Clark were up to, we started our series of Commodity Surveys nearly three years ago. Each month we take some chemical and endeavor to tell who makes it, from what, how, where, how much, what it costs and what it's used for. We have an advantage. It is timeliness. We try to bring you up-to-the-minute data on commodities

of current interest.

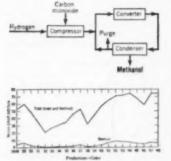
This timeliness will be one reason for our continuing the series. Another reason is "who." If it weren't for these two factors we might say that Faith, Keyes and Clark have done the job for us. They have taken 107 tonnage chemicals and prepared 107 "Commodity Surveys." They set up an outline to follow for each: (1) name and formula, (2) current processes, (3) equations and yield, (4) raw materials, (5) production chart, (6) use pattern, (7) prices, (8) properties, grades, containers, etc., (9) economic aspects including plant costs, (10) a

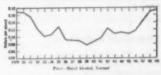
map of plant locations.

They followed their outline meticulously and made a real contribution to the literature as well as a nicelooking book. The production, process and economic data will be really useful to a lot of people—in addition to vice presidents. It will be an ideal textbook for courses emphasizing the economic side of the chemical indus-

Our only quarrel with the authors is about who and where. They don't say who makes the commodities. And their maps indicate all plants: full size and pilot; operating and shut down. But this isn't serious. Lists of producers are available. Their inclusion in "Industrial Chemicals" would have consumed space which the authors have wisely decided was better devoted to additional chemicals.—LBP

Samples:

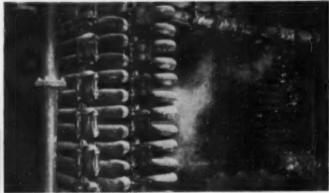






These samples, taken at random, are typical. They show how some of Faith's data can be gotten almost at a glance. (The charts and map are half original size.)

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Non-Benzenoid Rings

HETEROCYCLIC COMPOUNDS. Vol. 1. (Three-, four-, five-, and six-membered monocyclic compounds containing one O, N, and S atom.) Edited by Robert C. Elderfield. John Wiley & Sons, New York. 703 pages. \$11.

Reviewed by Edgar A. Steck

For many years, this country relied upon foreign authors for the compilation of compendia, but the scientific world will soon be indebted to the scholarly patience of our groups. The series of which this is the first volume will probably rank with the more valuable contributions made to the furthering of interpretations in heterocyclic systems. Professor Elderfield and his team of co-workers have not assembled data hurriedly, nor have they deviated from clear conciseness in evaluating the progress in the fields discussed. The presentation of the treatise may have been delayed through the desire for excellence, but such results are justification enough. It is hoped that the series may follow the pattern set by this volume.

The discussion of heterocyclic types does not resurrect isolated studies to extend the text, but does appear to have been the result of a careful sorting to present general pertinent information. A wealth of data is available directly concerning the applicability of many series to further syntheses, their biological activities, physico-chemical aspects and allied implications, and also comments on certain industrial practices. While the background of most of the individual authors is academic in nature, the importance of patent literature is evident by numerous references to such sources. The existence of monographs in certain of the fields discussed has limited the treatment in this series and aids in over-all development.

A (condensed) table of contents will indicate the scope of the work: ethylene oxide and trimethylene oxides; ethylenimine; azete derivatives; furans; thiophenes; pyrroles; monocyclic pyrans, pyrones, thiapyrans and thiapyrones; pyridines and related types. An alphabetical list of contributors, all of whom deserve gratitude, includes S. A. Ballard, F. F. Blicke, A. H. Corwin, T. N. Dodd, Jr., R. G. Elderfield, J. Fried, J. S. Fruton, R. B. Henderson, D. S. Melstrom, H. S. Mosher, and S. Winstein.

Few criticisms can be leveled at this splendid result of fine collaboration by active research scientists. It might be ventured, however, that the use of proprietary names (as in the case of pharmaceuticals, e. g. Amidone, Demerol, and Pyribenzamine) is less satisfactory than the generic terms. Also, one might give the handsomely-bound volume less wear if an indication of contents could be placed on the cover. The sturdy binding and good paper used in the building of the volume will stand it in good stead during its frequent study. It is well worth the cost.

For Engineers

TECHNIQUE OF ORGANIC CHEMISTRY, Vol. III. Edited by Arnold Weissberger. Interscience Publishers, Inc., New York. 661 pages. \$10. Reviewed by F. C. Nachod

The first volumes of this series have been addressed mainly to the chemist. This volume now is primarily for the chemical engineer. It is replete with a wealth of information as is evident from the chapter headings: heating and cooling, mixing, centrifuging, extraction and distribution, dialysis and electro-dialysis, crystallization and recrystallization, filtration, solvent removal, evaporation, and drying.

Noted industrial experts (G. Broughton, D. Craig, L. C. Craig, A. B. Cummings, R. S. Egly, H. B. Golding, M. P. Hofmann, J. H. Rushton, R. E. Stauffer, R. S. Tipson) give assurance to the readers that the subject matter is thoroughly and expertly treated.

Authors and editor must be congratulated for successfully living up to the promises and high standards set by the preceeding volumes of the series. Particularly the present volume is a "must" for all chemical engineers.

Essays

PROGRESS IN BIOCHEMISTRY—A Report on Biochemical Problems and on Biochemical Research Since 1939. By Felix Haurowitz. Interscience Publishers, Inc., New York. \$7.50.

Reviewed by Linus Pauling

In this book the author presents a summary of the progress of the whole field of biochemistry during the period of ten years beginning in 1939. The fields treated include the use of isotopes in chemistry, mineral metabolism, plant synthesis, carbohydrates, fatty acids, carotenoids, sterols, protein metabolism, hormones and vitamins, biologically active substances from natural sources, nucleic acids, enzymes, muscular contraction, chemistry of nervous excitation, immunochemistry, cytochemistry, and biochemical methods. References are given to about 2,400 papers (some of the names are misspelled and the author has in general not thought it (Continued)

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BOOKSHELF, CORL . .

worth while to include more than one mitial); the work presented in these papers is summarized in the chapters, often with an expression of the author's opinion about its significance and reliability. The ordering of the material is such as to give each chapter the character of a summarizing essay on the field of biochemistry that is covered.

Two more general chapters have also been included, one on intermolecular forces in living matter, and one on thermodynamics and kinetics in biochemical reactions. The discussion of these fields, which extends also over the period before 1939, is incomplete and superficial, in part because of the madequacy of the space.

The book should be useful to any-

one working in the field of biochemistry.

Guldebook

BIOPHYSICAL RESEARCH METHODS. Edited by Fred M. Uber. Interscience Publishers, New York. 667 pages. \$9.50.

Reviewed by Alex Lesuk

The editor states in the preface that this book is intended as a guide to "scientists who must resort to physical methods of research for the solution of biological, medical, and agricultural problems.

With this goal in mind, he has evidently requested the various contributors to describe the fundamental principles underlying the respective physical methods discussed, the requisite equipment and technical skill, and the potential applications.

The physical methods which have been selected for discussion in the book are osmotic pressure measurements, centrifugation, viscosity measurements, temperature determinations, calorimetric measurements, quick-freezing and the freezing-drying process, bioelectric measurements electrophoresis, ultrasonic vibrations, the use of special microscopes, electron microscopy, action spectra and absorption spectra, X-rays and X-irradiation, electrons, neutrons, and alpha particles, stable isotopes as tracers, and radioactive tracers. The editor has also written a chapter, spiced with welcome touches of humor, in which he discusses with logic the design and execution of experiments and the responsibilities of the scientist.

It would hardly serve the purposes of this review to discuss the merits of the different chapters individually. Naturally, in a work of this kind, several of these chapters do not merit the high praise due some of the others. Nonetheless, it is the reviewer's opinion that the editor has succeeded admirably in his intent; in general, it should be possible for the research scientist or the mature gradnate student in the biological and related sciences to evaluate the applicability of a particular physical method to his immediate problem after a study of the respective chapter; references are provided to facilitate the search for additional details.

RECENT BOOKS & PAMPHLETS

Plastics. "A Program for Flastics Educa-tion in Science and Engineering." Prin-ciples whereby plastics can be incorpo-rated into the educational program at both undergraduate and graduate levels; how those principles can be implemented. 16 pages, Gratis, Seelety of the Plastics Industry, Inc., 225 Madison Ave., New York 17, N. X.

Safety, "Radiation Hazards of Radioactive Isotopes in Fire Emergencies." Appraisal of nature and extent of potential radiocontamination. 16 pages. International Association of Fire Chiefs, 22 East 18th St., New York 16, N. Y.

Safety. "Safety Code for Industrial Power Trucks." Covers construction and design features, general and specific safety regu-lations. \$2 pages. ASA B86.1-1950, Amer-ican Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

Aluminum. "The A-B-C's of Aluminum." History, characteristics, production and fabrication, applications. Numerous photo-graphs, 96 pages, Gratis, Reynolds Metals Co., 2500 South Third St., Louisville, Ky.

Wood. "Toward Wiser Use of Wood." Nontechnical review of the steps in the progress of the past 40 years. 36 pages. U. S. Forest Froducts Laboratory, North Walnut Et., Madison, Wis.

Stainless Steels. "Symposium on Evalua-tion Tests for Stainless Steels." Focuses on significance of results of laboratory evaluation tests with relation to practical experience under diverse service condi-tions, and the effects on behavior of the al-

loys, in test and in use, of lowering carbon contents to extremely low Hmits. Liberally illustrated. 236 pages. \$2.50. Special Technical Publication No. 93, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Steels and Alleys. "Data on Corrosion-and Heat-Resistant Steels and Alleys— Wrought and Cast." Collection of tables. 84 pages, 82,50. Special Technical Pub-lication No. 52-A, American Society for Testing Materiais, 1916 Race St., Phila-delphia 3, Pa.

salvest Extraction. "Solvent Extraction of Oliseed." Basic principles of solvest extraction, batch and continuous methods, separation and purification of products and byproducts, choice of solvents, applications to specific oliseeds, economic aspects and fature trends. Flow charts, equipment photographs and sketches, seen tables. By E. No. 25, theorem and the control of Technology, State Engineering Experiment Station, Atlanta, Ga. Solvent Extraction.

Organolithium, "Supplement to Annotated Compounds in Organic Synthesin," Covers Bibliography on the Use of Organolithium 1945-49 and contains abstracts of over 150 papers. Will be mailed, free of charges to those who received the Annotated fills-lingraphy. Metalloy Corp. Minneapolis.

Water. "Bets Handbook of Industrial Water Conditioning." Compares general water treatment practices such as aeration, congulation. Latter chanters deal with spe-cific problems such as boiler scale forma-tion, silme and algae control. 198 pages. \$2.

Third edition, W. H. & L. D. Botz, Gilling-ham and Worth Stn., Philadelphia 24, Pa.

Accipione. "Accipione from Hydrocarbons." Nature of Schoch electric discharge process for making accipione from hydrocarbons; photographs and sketches of cuipiment. 40 pages. No. 5911, University of Texas, Bureau of Industrial Chemistry, Austin, Tex.

Plant Location. "Connellsville, Pennsylvania, the Home of Your Future Plant" Survey of natural resources, business and mance, transportation and labor conditions. Cardboard folder containing indexed lones-leaf sheets, 41 pages. Chamber of Commerce, McCrory Bldg., Connellsville, Pa.

Safety. "Labor-Management Cooperation for Safety." Principles on which safety procedures should be based according to the President's Conference on Industrial Safety. 5 pages. Bureau of Labor Standington 25, D. C.

Blochemistry, "Oxidation-Reduction Potentials in Bacteriology and Blochemistry." Implications and effects of oxidation-reduction conditions in metabolic precessor and living cells. By L. F. Hewitt. pages, 14.50. Sixth edition, Williams and Wilkins Co., Raitimore, Md.

Antifoaming. "The Inhibition of Foaming." Theory of foam inhibition by insoluble antifoaming agents and a review of current industrial problems and practices. By Sydney Ross. 40 pages. No. 52. Engineering and Science Series, Reusselaer Polytechnic Institute, Troy. N. Y.

Water. "National Water Policy." A statement of desirable policy with respect to the conservation, development and use of the national water resources. \$1.50. Emgineers Joint Council, 29 West 29th St., New York 18, N. Y.

Proceedings. "Thirtieth Annual Volume of Proceedings of the Chemical Engineering Group of the Society of Chemical Industry, 1948." British, 81 pages. 21s. Chemical Engineering Group, 56, Victoria St., London, S.W.I, England.

Steel Castings Handbook. Specifications, design considerations, applications, mechanical and physical properties of cast steel. Photographs and deteches number 440: 126 tables per pages 14. Steel Founders' Society of America, 520 Midland Bldg., Cleveland 15, Ohio.

Chemicals. "Special Report 2 on Fatty Oils and Acids, Fats and Waxes." Official abstracts of 212 United States patents on the subjects of fatty oils, fatty acids, waxes, etc., which have entered the publical patents of the public of the p

Foreign Relations. "Science and Foreign Relations." Discussion of present policies of the State Department and methods used in diplomatic relations for exchange of technical information and closer cooperation of the state of t

Coal Tar. "Imports of Coal-Tar Products 1949." Gives U. 8. imports for consumption of intermediates, dyes, medicinals, flavor and perfume materials, and other finished coal-tar products entered in 1948 under paragraph 27 and 28 of the Tariff Act of 1920. U. 8. Tariff Commission unnumbered document, Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Foreign Trade. "Foreign Commerce Yearbook 1948." Compilation of foreign trade statistics, resuming the prevar series with data for 1948. Last previous yearbook gave data for 1939. Cloth bound \$2. Department of Commerce unnumbered document, Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Gasoline. "Natural Gasoline and Cycle Plants in the United States, January 1, 1950." A directory, Mimeographed. By D. S. Colby and E. M. Seeley, Rureau of Mines Information Circular 7578, Superintendent of Documents, Government Printing Office, Washington 25, D. C. F. A.

What every Chemical Engineer

should know about Pressure Filters

Pressure filters are probably the most commonly used filters in the processing industries and are, with few exceptions, intermittent or batch filters. Although there are many types of pressure filters on the market—disc, porous stone, cartridge, etc.—the plate-type and leaf-type are the most generally used for medium- and large-scale operations.

PLATE-TYPE FILTERS

The best known and most widely-used of the plate-type is the plate-and-frame filter press which usually employs filter cloth as a base for the filter cake. Also well known are the horizontal-plate filters which have certain definite advantages in small sires for handling relatively small-batch operations, but which are high in cost and unnecessarily bulky when large filter areas are required.

LEAF FILTERS

There are many different types of pressure-leaf filters, such as the horizontal leaf, rotating leaf, and vertical leaf. Probably the simplest in design and most practical in application is the Niagara vertical leaf filter, employing all-metal filter leaves covered with permanent, finemesh wire filter cloth with opening, small enough to quickly take a precoat of even the finest commercial filter-aids.

Limitations of this filter are that (1) It is a clarifying filter and cannot efficiently handle slurries with high percentages of solids; (2) It is not ideally suitable where the cake, not the liquid, is valuable.

However, it is ideally suited to most applications where plate-and-frame presses and other pressure filters are used for clarification purposes. Designed to combine most of the advantages of these other filters, it overcomes many of the disadvantages, particularly of the filter press, such as excessive time and labor for cleaning, poor cake-washing characteristics, bulky construction, uneven pressure distribution over total area, product leakage, non-uniform precoating, etc.

ADVANTAGES

Main advantages of Niagara Filters are:

- Totally enclosed, high-pressure filtration.
- (2) Elimination of all labor and expenses connected with handling, washing, replacement, etc., of filter cloths.
- (3) Higher rates of flow per unit filter
- (4) Complete, sparkling filtrate clarity.
- Excellent cake-washing characteristics (almost true displacement washing).
- (6) Greatly reduced floor space requirements.
- (7) Rapid, easy cleaning and cake removal.
- (8) 100% corrosion resistant alloy metal construction . . . stainless steels, other metals if required, at reasonable cost.
- (9) Easily jacketed for high-temperature operation.
- (10) Maintenance almost eliminated, since there are no moving parts.
- One-man operation and handling, even of a battery.
- (12) Unit filter area up to 500 square feet.
- (15) Lower first cost where corrosionresistant materials are required.

LOW OPERATING COST

This filter, although relatively new in its application to the chemical and processing industries, is rapidly replacing many of the traditional, old-style pressure filters. This trend is the result of an increasing tendency to use corrosion-resistant equipment and the realization by plant operators that lower equipment operating and maintenance costs must be achieved to keep profits up in the squeeze between increased labor and material costs and an increasingly competitive price situation.

For additional data and information on the Niagara pressure-leaf filter, the new self-cleaning "Auto-Sluice" filter, and Niagara's pilot filter rental service, write Niagara Filter Corporation, 3007 Main St., Buffalo 14, N. Y.



Manufacturing penicillin is a painstaking job requiring the most accurate controls throughout the entire process. At the Lederle Laboratories Division of American Cyanomid Company, Poorl Biver, New York, KATHABAR wrings 30 gallons per hour from a 3500 cfm flow of air to deliver a controlled-humidity etmosphere to the penicillin processing rooms. As a slight indication of the control required, KATHABAR delivers air at 9 grains per pound of maisture to maintain m condition in the processing rooms of 16 grains per pound of moisture. If the atmosphere exceeds the vital 16 grains per pound of moisture, the hygroscopic penicillin is quickly damaged. KATHABAR is used extensively throughout the drug manufacturing field for such vital humidity control at economical cost. This is just another example of how KATHABAR can help you solve your production problem.

Write today for the complete story,

The Kathabar system of humidity control for industrial processes and comfort offers you:

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★ DEPENDABILITY—Few moving parts—system serviced while in operation—non-corrective solution.

* EASE OF INSTALLATION—Simple duct errangement—compact and lightweight—minimum assembly required.

★ ECONOMY—Extra low operating costneeds no licensed engineer. PREVENTS FROST ON LOW TEMPERATURE COILS

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DEPARTMENT OF THE MONTH

New Technical Literature

(Continued from page 128)

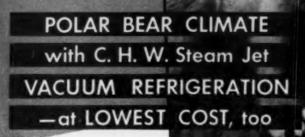
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UBJECT	PEATURES				COM	PANY	
Ротори	finall, medianical, o	il-maind high vacuum	pump.	Graphs	Kinne	ny Mfg	Co.

206A pump which operates with 1/3 hp. motor, pump weight 90 lbs. Large diagrammatic sketch shows dimensions Photoehotris calarimeter with built-in stabilizar intended for conservement of transparent color of clear liquida. Discusses applications in oblicine control, pharmaceuti-cale, pulp and paper, espar refining, trace analysis, etc. Liote accessories and replacement parts. 4 pages. [astroments Photovolt Corp. 214R Pittsburgh Corning Corp. **Ensulation** Applications of rigid cellular glass insulation at normal temperature (30 to 150 deg. F.), Photographs help describe installation, shapes and eises available. Chart lists accessory materials and their sources. 20 pages. 2080 Mothods of fabricating, characteristics of welded steel tubing. Sketches show structural officiency per pound of metal when tubing is used as beam or column. Size limits, finish, toleraness. 12 pages. Tables Armen Steel Corp. 2040 Packaging Drawing shows meter which automatically dispenses any preset quantity of liquid, from 1 to 100 gal., for filling drums or other containers. Iron, broase or stainless construction. Photographs show parts. 4 pages. Bower, Inc. 234E Typical system for bulk tank storage. Recommendation of congn and construction materials for tanks, pipe line pumps and fifters, and on tank our unloading, pressure empty car for return, antety. Full page drawings equipment types and arrangements. Furthernt data_in plasticizer properties. 12 pages. Monunto Chemical Plasticiser Storage DOGP Pressure regulators, altitude valves, pump governors, straines. Schematic drawings show design and operating features. Clearte give dimensions and priess. Pressure regulator service chart gives comparative values of the line in various applications. 30 pages. Davis Regulator Co. 2040 Gloon Photographs of typical applications of radiant glass panels usefule years drying, petroleum fuel dehydration. Covers physical, electrical, thermal, chemical properties. Gives etandard since and ratings. 8 pages. Corning Glass Works 25411 Hydrostatic device that directly shows weight, volume or depth of liquids in storage or in process. Operation and construction data; photographs showing uses in the dairy, brewery, distilleries and restfying plants, measuring shemicals, etc. 12 pages. Instruments King Engineering Corp. 2562 Chart gives individual properties of six water dispersions of polyvinyl chloride base resens, those of 4 mil cast film and 1 mil latex consted paper made with them; methods need by formulators; fields of application. 4 pages. B. F. Goodrich Chemical Co. Resina 256.3 Metal-enclosed buses available in voltages up to 23-kv. and current ratings to 6000 amps. Comparison of buses on the basis of relative heating, construction features, testing. Drawings and dimensions are listed for segre-gated phase and isolated phase types. 15 pages. Delta-Star Electric Co. Dax Bars 204K American District Stonen Co. Y- and T-type strainers, section strainers, multiflow exparators and reserver-separators. Dimensions, weights, list prices. Capacities, flange dimensions, service pres-eure ratings. 16 pages. Eunimment. 2561. Production method for lead-free sine oxide. Describes general properties, use in rubber compounds, protective coxings, chemical, pharmacestical, caramic industries. Photomicrographs and curves show particle size distribu-tion in various grades. Request for this booklet must be made on company letterhead. 35 pages. Zinc Oxide St. Joseph Lend Co. Cardboard, slide rule device presents pertinent data for 150 and 300 lb. A.S.A. Standard as well as for standard, extra heavy, 3000 and 6000 lb. coupling. Nonter Corp. Coupling 25634

256M III and 200 lb. A.S.A. itsanderd as well as for standard, exire heavy, 3000 and 0000 lb. outpling.

Instruments

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Polar bears know what they're doing when they choose to remain where they can depend on the constantly cold climate they need. You, too, can equally depend on C. H. W. Steam Jet Vacuum Refrigeration to give you reguired cooling conditions for your chemical or food process requirements. And, of equal importance, is its economy. When compared to mechanical types of refrigeration, C. H. W. Steam Jet Vacuum Refrigeration Systems are lowest in purchase price, lowest in installation cost and lowest in maintenance. (In many cases, the cost of operating a vacuum refrigeration system is 5 to 20% less than for an. ammonia or carbon dioxide system for temperatures ranging from 35 to 60° F.) Furthermore, since water is the refrigerant, hazards of noxious or poisonous ammonia, sulphur dioxide, etc. are eliminated. Cooling is by flash evaporation, using either live or exhaust steam. The system is easily operated and service life is long. For complete information on how C. H. W. Steam Jet Vacuum Refrigeration can be applied to your cooling problem, write now for Catalog No. 1462.

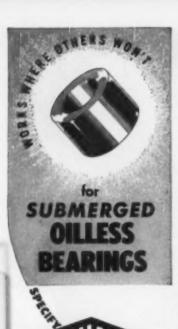
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NEW TECHNICAL LITERATURE cont.

Phosphate Conting § 258A	Describes phosphate coating chemicals and processes for paint-bonding, rusk proofing, protecting friction surfaces, improving drawing and extresion. If pages	American Chemical Paint Co.
Instruments 256B	Lover, float and motor operated valves, pilot valves. Schematic drawings show design and operating features. Charte give dimensions and prices. 8 pages.	Davis Regulator Co.
Resina 258C	Application photographs of synthetic phonolic contings, thormosetting and thermoplastic resins, molding com- pounds etc. 26 pages.	Heresite & Chemica Co.
Sifter 2581)	Ceiling suspended, free-ewinging sifter available in three sizes. Photographs, description of construction, specifications, operation. 4 pages.	Richmond Mfg. Co.
Retary Joint 268E	For high and low pressures and temperatures in trans- ferring steam and all liquids in and out of machines, revolving drams or rollers. Photograph, dimensions installation shetch. 4 pages.	Phillips Rotary Joint and Valve Co.
lon Exchango 250F	Monobed ion exchange systems, their history, behavior, present performance, potential uses is water-conditioning, chemical process industries. Covers design and operation of equipment. 13 pages.	Rohm & Hase Co.
Enstrumenta 208G	Flow diagrams show one, two and three element buller feedwater control systems. Applications of each are discussed. Photographs of components. Spages.	Republic Flow Motors
Lighting 258H	Planned lighting for industry. Subject is covered from management viewpoint, broken down into: economies, program development, equipment selection. 32 pages.	Benjamin Electric Mfg. Co.
Valves 258f	Valves for sir, water or sil services in nominal pipe sices up to 3 in. and for pressures to LMO psi. Specifications, priors. Loose-less booklet.	Airmatic Valve, Inc.
Materials Handling 2583	Circular bin discharger for handling pulveriesd, granular, clutenous and soft lump materials. Sketches and cut-away photographs show operation and parts. 4 pages.	Stephene-Adamsun Mfg. Co.
Chemicals 258K	Three bulletins. One presents physical properties, latest specifications, shipping and handling information on section discretate. 3 pages. The second covers the same ground for visy's nortate. 4 pages. The third is on sine acottate. 2 pages.	United States Vana- dium Corp.
Materials Handling 2581,	Power shovels and cranes. Phantum and built-up views show available combinations; interchangeable units or packaged assemblies. 18 pages.	Thew Shovel Co.
Consultant 258M	Portrays the work of scientists, engineers, concultants and laboratories at this consulting firm. Scope of services in research, process and product development etc. 6 pages.	Sam Tour & Co.
Pumps 224N	Shetches show vertical turbine pump applied to river and re-lift service, boosting, resirculation, cooling tower, dvainage, gas and oil pumping. Cutaway drawings of pump lowls and disobarge column. 16 pages.	Layne & Bowler, Inc.
Need 25AP	Lieta all popular grades of hot rolled and cold finished carbon and alloy steel bars, giving principal characteris- tics, mechanical properties and uses. 4 pages.	Joseph T. Ryerson & Son
Carrosion Resistance 2546)	Chemical construction materials including linings, coments, briek and tile, briek sheathings, protective cont- ings, floors. Charts give recommendations for use against various chemicals. 8 pages.	Atlas Mineral Products Co.
Mat. Handling 25AR	Vibrating shaker for reconditioning of oil well drilling mud. Photographs show construction details. 12 pages.	Link-Belt Co.
Insulation 2589	Insulating panel unit consisting of a core of laminated cane fiber board surfaced on both sides with cement-nebestoe boards bonded with moisture-proof bituminous adhesive. Drawings, design and construction application data.	Celotex Corp.



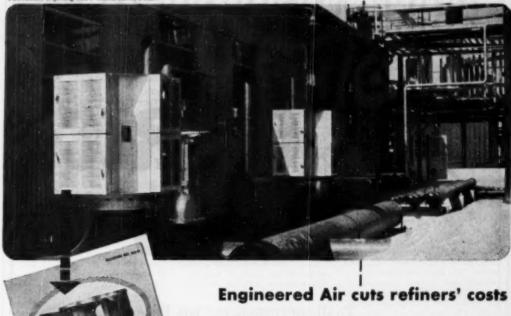
Tables recommend corrosion resistant applications of a line of paints consisting of blends of chemically inert plastic resins, combined with plasticisers, stabilisers etc. 12 pages.

U. H. Stoneware Co.

Sprout, Waldron & Co.

These "Cats" get Longer Life

Punhandle Refining Co., Wichita Falls, Toxas.



REFINING petroleum, just as the term implies, means getting rid of impurities. Even the catalytic compounds have to be kept clean and that meant frequent replacement of catalysts . . . expensive but necessary.

Engineers reasoned a good way to stop contamination of costly catalysts was to catch dirt at the start-capture it at the air intake.

Because AAF makes every kind of air filter, expressly for particular air cleaning problems, those catalysts have longer life now. In the picture above you see AAF Type OCH on the job. Six units in the housing behind those weather louvres maintain a strict "keep out" attitude toward air borne dirt. Filters can be taken out, cleaned quickly and replaced.

The catalytic process functions better with clean air. The catalytic compound stays in service far longer, saving dollars for the refiner.

AAF equipment can be on the job for you. Why not call in the air experts, let AAF find a "profit in the air" for you. Just write to the address below.

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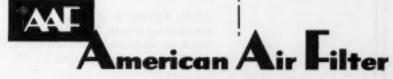
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PRICE ANNOUNCEMENT

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Chemical Economics

RICHARD F. WARREN, Market Editor

Buyers' Market Disappears as War Threat And Strikes Cut Into Supplies

Expanding demand created by the Korean War and the recent strikes in the alkali industry have combined to wipe out the buyers' market in chemicals. The effects of the strikes are being felt in the glass, leather, detergent, insecticide and petroleum in-dustries. The war has aggravated the price climb in many chemicals. While most chemical producers are making every effort to hold prices at pre-Korean levels, there has been considerable reselling of chemicals at higher prices. This situation has developed as our industrial consumption of chemicals raced along at record rates. Here is a brief summary of the current supply-demand situation in the major chemical consuming industries as we moved into our third month of

Fertilizers—We are in a very strong nitrogen supply situation. We have increased our nitrogen capacity about 200 percent since 1940 and even with nitrogen consumption in plant food running at the rate of a million tons in 1949 (a record rate), there is no reason to fear a shortage. Even in the event that more capacity is needed it could be readily built by industry.

Production of potash has been running close to capacity levels this year. Agricultural shipments have reached an annual rate of more than a million tons of K.O. Chemical needs take only about 7 percent of our total output, according to the Potash Institute.

Phosphate fertilizers are feeling the pinch of a heavy demand for sulphuric acid. The tight acid situation has held back the seasonal surge in superphosphate production to a limited extent. However, production is running ahead of last year's rates.

Glass—This industry was one of the first to feel the impact of the cutback in soda ash supplies caused by the strikes against Solvay and Diamond Alkali. Since glass is the nation's biggest consumer of ash, it naturally was hit the hardest. Seasonal expansions in Supply & Bemand

 Demand keeps prices climbing. Both Chemical Engineering indexes rose last month—see next page.

 Benzene from domestic coke-oven operators now costs up to 30c. per gal. Imports have not eased demand.

 Strikes have kept caustic and soda ash gray market prices several cents per pound above producer rates.

 Alcohol from grains is back up to about 75c, per gal. But imported ethyl is arriving here at 28c.

 Rubber allocations will cut our civilian use to 90,000 tons per month.
 Reason: Stockpiling.

containers output for the food and beverage industries were curtailed as a result of the strike. With settlement of the labor problems the glass industry should snap back to exceed its 1949 rate of chemical consumption.

Pulp and Paper—Pulp demand is running about 30 percent ahead of the corresponding 1949 rates. Some producers are using a system of voluntary allocations. Paper mills are also finding it difficult to supply customers' demands in spite of the fact that they are operating at capacity rates.

Synthetic Fibers—Rayon, a big chemical customer, is running about 40 percent ahead of last summer's rate and is setting new records again after fully recovering from its 1949 setback. Other synthetic fibers are also running at close to capacity rates and nylon's demand still exceeds supplies as benzene shortages crimp producers efforts to catch up. Orlon production is getting under way and should be substantial soon.

Textiles—Another substantial chemical user, the textile industry is using about 35 percent more chemicals now than it consumed in the corresponding

1949 period. Woolens are using about 50 percent more than they needed last

With synthetic-natural fiber mixtures swelling textile demand, it looks as if textile chemicals will chalk up a good year. Additional factors stimulating the growth of this segment of the process industries are the steady population growth and a coming cutback in some durable goods, which should cause more money to be spent on textile products.

Rubber-Consumption of chemicals has hit a new high in the rubber industry. In June, rubber use topped the record set in May and even this record will probably be surpassed in the fall as more synthetic rubber capacity is reactivated and the demand continues to mount. June consumption exceeded both imports and synthetic production. The annual consumption rate has reached 1,200,000 long tons.

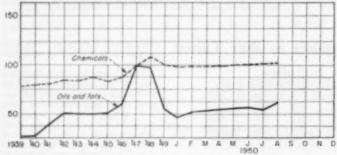
However, the government has placed a ceiling on consumption of new rubber (including natural and synthetic rubber but excluding natural rubber lates). This limits non-defense use to 90,000 long tons per month. Military orders will be filled with additional allotments of rubber. Purpose of the order is to replenish our stockpile of natural rubber.

Soap—chemical consumption in soap has been running about 11 percent below last year's rate. However, detergents moved in and picked up a bigger share of the market in the first half of the year. As a result the combined consumption of soap and synthetic detergents topped the levels reached in the corresponding 1949 months by about 4 percent.

According to figures released by the Association of Soap and Glycerine Producers, sales of synthetic detergents reached 521,903,000 lb. in the first half of 1950. This represents a gain of more than 60 percent over the consumption rate achieved in the January-June 1949 period. Thus 1947 forecasts for a billion pounds per year seem close to fruition. The last half of this year will probably surpass the records established in the first six months.

PRICE, CONSUMPTION AND PRODUCTION TRENDS

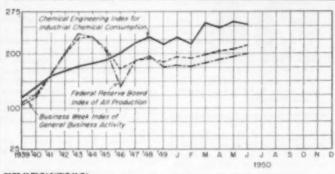
PRICES.



Chemical Engineering's Price Index a month, a year, and two years ago

As of September Last month September 1949 September 1948	1.	bemiento 107.85 103.27 100.57	01lo & Fata 71,46 62,33 55,49 93,53
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CONSUMPTION _

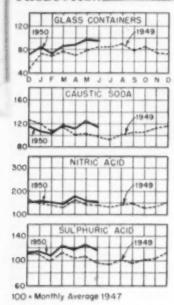


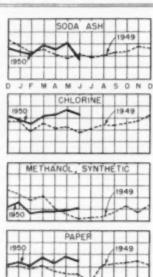
Chemical Engineering's Consumption Index for Industrial Chemicals

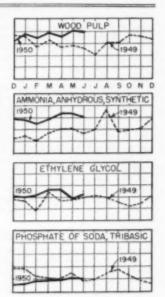
(A breakdown by consuming industries)

	-	
	May (Revised)	June
Fertilizers Pulp and paper Petroleum refining Glass Faint and varnish Iron and steel Rayon Textiles Coal products Leather Explosities Rubber Plastics	. 59 M3 . 7, 40 22, 52 28, 59 15, 60 20, 75 10, 78 4, 72 5, 72	50,25 26,25 22,05 21,42 30,20 14,95 30,19 11,61 10,92 6,14 8,42 6,42 15,52
INDEX		252.34 == 100

PRODUCTION







Cut Materials Unloading Costs 2 Ways CAR SHAKER

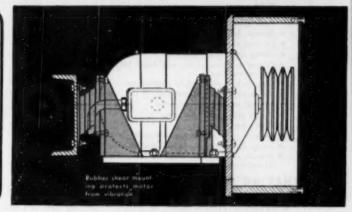
1. SAVE TIME MAN-HOURS

In a few minutes a hopperbottom carload of bulk chemicals or other granular materials can be emptied with the new Allis-Chalmers Car Shaker. Labor is saved at the unloading station. Expensive demurrage costs may be avoided!



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Its simplified mechanism . . . its unique arrangement for hydraulically removing self-aligning bearings for replacement purposes . . . and many other features pay off in low maintenance and long service!

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WHAT THEY ARE

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The Versenes^o are extremely versatile and stable at high temperatures. Here are some of the things they do:

- · Soften water without precipitation.
- · Complex ferric iron in up to 40% caustic solution.
- · Prevent uneven and spotty dyeing of textiles.
- Inactivate divalent metals such as cobalt, capper, nickel.
- Inactivate trivalent iron, calcium, magnesium and other metallic salts.
- · Remove hardwater deposits and precipitates.
- · Dissolve grease and food deposits.
- · Clarify liquid soap solutions.
- Prevent oxidation of fats, oils, toaps, fatty acids, organic materials.
- . Stop reactions catalyzed by metallic ions.
- · Aid in purification of materials.
- · Separate metals from each other.
- · Reduce activity of metal ions.
- · Purify drugs.
- · Stabilize color and maintain flexibility in plastics.
- . Lower viscosity of starch and glue solutions.
- Provide an analytical reagent in Schwartzenbach method of water analysis.

HOW THEY DO IT

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WHAT TO DO ABOUT IT

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ANTIBIOTICS

Perhaps you are alive today because of the rapid expansion in this part of the chemical industry. Bigger yields have aided production rates.

JOHN R. SKEEN, Foster D. Snell, Inc., New York, N. Y.

Antibiotics continue to make news. Just a decade ago they were "miracle drugs" of promise. This year sales will probably exceed 200 million dollars and represent three quarters of the value of synthetic medicinals—sulfas, vitamins, barbiturates, and all the rest. Plans for expansion suggest that the output will be a third greater next year. If the tepid war blows warmer,

it may be anything.

The term, antibiotic, was introduced by Selman A. Waksman. It now appears to include isolates from any plant or animal which in small concentration inhibit the life processes of microorganisms, including viruses. Several hundred have been described. However, to be commercially valuable, they must suppress activity of all or almost all of the disease-causing organisms without significantly affecting the patient. Of this group, penicillin is most important, followed by streptomycin. Next in order come aureomycin, chloroamphenicol (chloromycetin), and terramycin. Also integral with modern medicine are bacitricin and tyrothricin. The list is small and grows slowly.

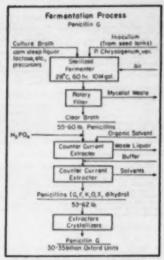
Penicillin is described as the "nearly ideal antibiotic," By no means a cure-all it is employed in infections caused by gram-positive organisms such as streptococci and pneumococci. It is of value in the treatment of syphilis, the gonococci and meningococci. Streptomycin is active against the Gram-negative forms. The list of applications is long and includes effectiveness against cases of peritonitis, tuberculosis, urinary infections, influenza, tularemia. Other antibiotics are supplementary but with some outstanding attributes. Aureomycin is believed best for staphylococcal infections, terramycin for gangrene, while chloromycetin only is effective against typhoid. Otherwise, the three are generally competitive. The performance of these materials in combating disease is credible only from the established record. Aureomycin is the first to establish a position in the treatment of virus infections. While limited to virus pneumonia, there is a real expectancy that colds, flu, and cancer will yield to other anti-biotics yet to appear. The possibilities seem limitless.

While it took a great war to create an antibiotic industry in a few years, recognition of microbial antagonism dates from 1877 when Pasteur and loubert described the effect on a cul-

ture of anthrax bacillus.

Professor A. Fleming, of St. Mary's Hospital in London, observed in 1929 that a Petri culture of staphylococci failed to develop in one small portion. Upon investigation, this phenomenon was traced to a product of Penicillium notatum, a relatively rare member of the genus forming the common blue mold of bread. (Had this discovery aroused more than academic interest perhaps the sulfa drugs would have attained no great prominence.) Subsidized by the Rockefeller Foundation, a group later worked at Oxford University and included H. W. Florey and E. Chain. In 1940 they presented findings respecting penicillin obtained in relatively concentrated form. Clinical results were reported the next year. A period of the most constructive technical and commercial cooperation immediately followed. How much of this activity was stimulated by the discovery of gramicidin by Dubos in 1938 and its subsequent recognition is uncertain. In any event the foundation brought Dr. Florey to this

At the urgent request of Dr. A. N. Richards, chairman of the Committee on Medical Research, OSRD, Merck



How They Are Made

and Co., E. R. Squibb and Sons, and Charles Pfizer and Co. coordinated their research, and a reciprocal arrangement was made with British workers. In addition the resources of the Northern Regional Laboratory of the Department of Agriculture were enlisted in the development of better strains and media. The services of investigators at Penn State College, MIT and the Universities of Minnesota and Stanford were later enlisted. This entire program was war-stimulated and the distribution of the perennially limited supply was supervised by the committee on chemotherapeutics of the National Research Council. The allocation was executed by the War Production Board under order number M-338.

First production was by cumbersome and expensive fermentation mostly in milk bottles. Growth on moist bran supported in large traysa modification of mushroom growing —offered promise. However, Merck pioneered the "submerged" method which was in operation by 1943. Here, tanks now of 20,000 gal. capacity, are charged with sterile culture and inocculated with the organism. The necessary sterile air for growth is injected at the tank bottom. After 60 hr. the liquor containing penicillins is separated from the vegetative growths. After a long series of separations and under difficulty-conpurifications, trolled sterile conditions, a pure product is obtained. Fleming's Penicillium notatum at first produced only at the rate of 100 Oxford units per milliliter (Continued)

How Yields Have Been Improved

Time	Cultures	Yield 1	Penicillium specie
Early W. W. II 1945-July '44 July '44-Mar. '46 1945-1948 1949' 1949'	Submerged Submerged Submerged Submerged Submerged Submerged	15-30 100 200 to 500 000-700 1,100-2,000	P. sotatom, var. P. sotatom, var. P. chrysogesum, var. P. chrysogesum, war. strains P. chrysogesum, Wa. strain P. chrysogesum, irradiced Wis- comin and other strains

Oxford units produced per milliliter of bose; approximate industry average.
While the Wisconsin strain was dominant in 1949, irradiation caused mutations and it is said commercial use began with yields approaching 1,000 O.U. per ml.; early 1950, the industry average was about 1,100 O.U. and in July, 1,200 is a closer guess; it is still resing.

Where They are Made: These plants supply our antibiotic needs

Antibiotic Producers: Operating Dates!

From Abbost Laboratories Americae Cyanamid Co. J. F. Raber Chemical Co. Brotel Laboratorias. Commercial Solvents Corp. Cutter Laboratories. Heyden Chemical Corp. Fit Lilly & Co. March & Co. March & Co.	Punti River, N. Y. Phillipphyser, N. J. Rymenat, N. Y. Yorre Haute, Ind. Borkoley, Cal. Garfield, N. J. Indiapagonie, Ivet	1944 1943-48 1940-48 1943 1943 1943 1944 1944	1945-48 1945-48 1945 1945 1945 1944 1944	Auromycin ⁴ 1948	Chlorous perion (Chlorous yestati)	Terrangein
Monnanto Chessiani Cu. Parks, Davis & Co. Chos. Place & Cu.	Detroit, Mich. Brooklyn, N. Y New London, Conn.	1943 46 1943	1945-45 1945		1948 6.1967	Fx50
Schooling Industries, Inc. F. R. Squide & Suns. Upjohn Co. Wyeth, Inc.	Torre Haute, Ind. Lawrencelverg, Ind. New Brunawick, N. J. Nalamano, Mich. W. Chester, Pa.	1944 1943 1943 or 44 1943	1945 1945 1945			
Total active produces.	16	18	2	1	1	

*There are uncortainties about avveral "starting" dates; the published record is accepted where uncouries of producers fail; in addition, Bacitricia of Commercial Solvents as of economic importance. *Variously during 1943-65, these producers operated: Allied Moisianere Co., Brooklyn, N. Y., Ben Venue Laboratories, Berderd, Ohio, acquired by Commercial Solvents Corp.; Cheplin Biological Laboratories, Byrneuse, N. Y.; L. F. Lambert Co., Contevuile, P.a., Heichel Laboratories, W. Chester, Pa.; Winthrup Chemical Co., Reneasiner, N. Y. *Includes laboratory and pilot operations: commercial plants began with Merch, Sept. 1946. followed by Place and Bit Lilly than began, with Schechelley appearing in 1949. Commercial Solvents discontinuous and the Various of Commercial production early 1948. *For a time Pfleer made by fermentation for Particular Commercial Description of the Commercial Solvents discontinuous — and 1947 or early 1948, fermentation for Particular Commercial Commercial

COMMODITY SURVEY, cont. . .

of broth, This was one factor which led Merck to believe that a synthetic product was the economic answer to quantity production. The introduction of a different specie of the mold, and improvements in the nutrient and subsequent processing soon showed that synthetic procedures could not compete with fermentation. It is said

that one producer now obtains 2,000 O. U. per ml. of broth and 3,000 is well within the bounds of probability. Of the many penicillins developed, crystalline penicillin G is preferred and almost exclusively made.

It was perhaps inevitable that Rutgers University would contribute to the field of antibiotics. Dr. Selman A. Waksman has been an expert on soil flora for many years. Rene Dubos was

one of his students. The problem undertaken was to find an antibiotic effective against diseases caused by Gram-negative pathogenic forms, Waksman and his students looked to the soil and began a systematic procedure of isolation, identification and test. In September 1943 streptomycin resulted, a product of an actinomycete, Streptomyces griseus. The material was found effective by the Merck Institute for Therapeutic Research and the Mayo Clinic. A patent was granted to Waksman and assigned to the Rutgers University Research Foundation. The only supply was from flask cultures, paralleling the technique for penicillin. Merck undertook commercial production by fermenta-tion without delay. Pilot operations began in tanks in 1944. Material was soon available for exhaustive investigation. Because of the ever-increasing demand and the similarity to penicillin production, six firms were soon operating and the output was allocated by government. The dihydro form, be-lieved to be less toxic to the patient, is now preferred almost to the exclusion of its progenitors.

Chloroumphenicol is made by another actinomycete, Streptomyces venezuela, isolated by P. R. Burkholder from a soil sample from Caracas, Venezuela. Commercial production was undertaken by Pfizer and later by Parke, Davis in 1948. However, the organism is a relatively poor producer. Synthesized in practical yields, the material is the first antibiotic made commercially in this way. While Parke, Davis maintains an active fermentation plant it is now said to supply less than 20 percent of the total output. Production increased exponentially and the market expands.

Developed by the Lederle Laboratories, production of aureomycin be-

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How They Have Grown: Production has gone up and prices have come down

Antibiotics: Production, Exports and Price

	Penicillin ¹ (Billion O.U.)	Production Streptonycin ¹ (1,000 g.)	Dihydrostreptomycine (1,600 g.)	Funicilian* (Billion O.U.)	Streptomy cm° (1.000 g.)	Penicillin ¹ (3 per 160M O.U.)	Streptomyvin ⁴ (8 per g.)
1943 1944 1845 1946 1947 1948 1949 1950, 1Q	7,053 7,053 25,800 41,426 55,865	c. 300 1,175 9,676 37,700 83,099 6,105	17,863	42,155 e, 36,500 33,944 11,886	6. 3,450 c. 26,560 c. 26,560 63,412 12,186	2.83 1.00 0.30 0.38 0.34 0.12	4.60 3.16 1.87 0.88 0.60

*Also Astronomycia, Chloromanylomical, Terramycin: experimental only 1945. *1943-4: Was Production Board Release, Facts for Industry, notice 6-7-1: 1945-6: Symbolic Organic Chemicals, Tariff Commission, 1949-7: Symbolic Organic Chemicals, Tariff Commission, 1949-7: Symbolic Chemicals, action 8-2, March 1950 with addendant released by 20, 1949-8: Symbolic Chemicals, action 8-2, March 1950 with addendant released by 20, 1949-8: The production of Christopher and children with a few bars 2, 60 Mg, or nearly 190 million g, per yr. *Report N. F. F. 440, 1949-80; 1946-8: Industry and Christopher Chemicals and Chemicals and Chemicals and Christopher Chemicals and Christopher Chemicals and Chemicals and Chemicals and Christopher Chemicals and Christopher Chemicals and Christopher Chemicals and Christopher Chemicals and Chemicals and Christopher Chemicals and Chemicals

gan two years ago. In a medium similar to that used for penicillin, Streptoniyces aureofaciens gives excellent yields. There is, therefore, little likelihood of a competitive synthetic method. With skillful promotion, the virtues of aureomycin have been quickly recognized. The development of the market has probably been the most rapid of any of the antibiotics. The end is not yet in sight.

The newest of all is terramycin. This is a fermentation medicinal developed by the Pfizer Biochemical Research Division. Over 100,000 soil samples were examined and tested before Streptomyces rimosus was isolated last year. Terramycin in crystalline form was obtained, clinical evaluation made in 200 medical centers, and commercial availability announced January 1950. A. C. Finley and the group working with him are credited with the technical success.

Of the 16 producers of five major antibiotics, Pfizer is the largest and most diversified. Although making only one, Lederle is among the leaders which include Merck, Heyden and Commercial Solvents. Bristol Laboratories is either now in this class or will be very soon. Most will increase facilities this year. The development of new products accounts for this in some part but the entire trend appears to be something of a surprise in light of pessimistic opinions continuously expressed last year. Part of this was due to the vulnerable position of the industry with respect to exports.

The number and capacities of forcign plants are not known with accuracy. Production of penicillin has been close to 20 percent of the world supply and imports to as much more. At present rates foreign output will exceed 40,000 billion O.U. while imports will be nearly 50,000 billion. Domestic makers are taxing facilities and looking for more tanks. Potentially streptomycin is in an even more precarious position. For the past few years exports accounted for nearly three quarters of domestic supply at a time when plants were springing up all over Europe. This year there are 15 plants throughout the world either planned or operating with a total annual capacity of nearly 20 million grams. Approximately half is now made. If the pace of war increases, all this and more will be needed. - End

Others Make Penicillin

Periation Furnish Carmity) Unit: billion Oxford units

Unit bills	no Childre	of units		
	1947		1949	
	Plants	Capuc-	Tante	Capac-
North America I				
Canada, Cuba, Mexico	6	1,400		2,300
South America?				
Argentina, Brazil, Chile,		-		
Burone	9	30		*
West (exclusive of USSR				
nations)*		6,250	82	23,000
East (Germany, Coocho-	-	11,000	-	20,000
stevakia, Hungary,				
Puland)	6	50	6	1,660
CRiber				
Aria (China, India, Israel,				
Japan)s	. 9	50	6	3,000
Australia-Africa		1111A		990
Total	- 80	5,000+	No	22,110
		C10000	- 200	22,110

*Value only appreximate and capacities are variable with technology usel; potentially may be double the values given; a recapitulation of World Trade in Commediate, reports of Foreign Commerce World; trade announcements, and government officials. *Canada is the largest producer with 2 penales. *Deninning 1943. *The Argentine plant engineered by E. R. Squibb & Sous With 7 plants, vi. N. Commerce for 4,500 billion O.U. in 1947 and about 13 billion in 1949 with 12 producers; Farbwards at Hocebet announced a capacity of 1,200 billion units in 1949 and double his for an unstated time in the future; Soc. Francie la Fenicilline (Schonley technology) began in France in 1948 and in largest; of the 3 Danish producers, Lovens Kem. Fab. accounts for nearly S0 percent of the total — 680 billion O.U. or more. 'As of 1949, there were 11 licenseed to produce in Japan; 3 are known to make all or next and only these included here, total capacity 1949 — 4,500 billion O.U. and the sous of the color of the color of the color of the color of the bollion of the bollion of the bollion of the bollion of the billion of the bollion of the bollion of the sous of the bollion of the bollion of the boll of the color of the bollion of the boll of the boll of the bollion of the boll of the

BEST DEFENSE AGAINST FIRE

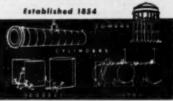
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NEW CONSTRUCTION

Proposed Work

- Ind., East Chicago-Sinclair Refining Co., 3500 Indianapolis Blvd., Indianapolis, plans to construct additions to its plant including offices and warehouse building. Estimated cnet \$100,000
- La., Sterlington—Commercial Solvents Corp., 17 East 42nd St., New York, N. Y., plans to construct an addition to its plant. Entimated cost \$1,000,000
- Mins., Hattiesburg.—Hercules Powder Co., Del-aware Trust Bldg., Wilmington, Del., plans to construct a Texephine insecticide plant here. Estimated cost \$1,750,000
- North Kansas City-Pittsburgh Flate Class Co., Grant Bldg., Pittsburgh, Pa., plans bu construct a warehouse at 12th St. and Burlington Ave. Everett & Bleistein Assoc., R. A. Long Bidg., Kansas City, Archts. Estimated cost \$300,000
- Most., Silver Bow—Victory Chemical Works, Board of Trade Bidg., Chicago, Ill., plans to construct an electric furnace phosphate plant. Estimated cost \$5,000,000
- eb., Lincoln-Goodyear Tire & Rubber Co., 1144 East Market St., Akron, O., plans to construct a plant here. Estimated cost \$1,000,000
- Tex., Houston-Kuhn Paint Co., 4020 Center St., plans to construct a 3 story varnish plant. Estimated cost \$90,000
- Tex., Ramney-Superior Oil Co., Oil & Can Bldg., Houston, plans to construct a gasoline plant here. Estimated cost \$1,500,000
- Man., Winnipeg-B. F. Goodrich Rubber Co. of Canada, Ltd., Winnipeg in having plans prepared by B. F. Goodrich Co., 333 West Lake St., Cheago, Ill., for a warehouse. Esti-mated cost \$175,000
- N. B., St. John-Syndicate, c/o J. W. Hill, General Development Co. of America, Ltd., 61 Bway., New York, N. Y., U. S. A., plans to construct a cement plant. Estimated cost \$1,000,000

Contracts Awarded

- Calif., Los Angeles-B. F. Goodrich Co., 500 South Main St., Akron, O., has awarded the contract for a factory addition to include warehouse for a factory addition to include warehouse facilities and shipping docks for 12 railroad cars and 14 trucks, to H. K. Ferguson Co., 1783 East 11th St., Cleveland, O. Estimated cost \$300,000 Estimated cost \$300,000
- Calif., Los Angeles-Goodyear Tire & Rubber Co., 6701 South Central Ave., has awarded the construct for alterations to its factory to Wm. P. Neil Construction & Maintenance Co., 2922 South Simone Dr., at \$91,000
- Clara-Permanente Cement Corp., Santa Clora, han awarded the contract for an addition to its plant to Kaiser Indus-tries, 1924 Bway., Oakland. Estimated cost \$732,000

- Current Projecte Contracto \$472,000 25,421,000 129,339,000 33,544,000 72,610,000 7,455,000 25,617,000 \$2,100,000 \$17,000 62,618,000 10,426,000 92,350,000 21,236,000 20,005,000 \$2,780,000 South Middle West... West of Mississippi Far West.... 7,890,000 1,175,000 Canada \$40,478,000 \$200,563,000 \$204,408,000 \$11,915,000 Total....
- building to Ragnar Benson, 4644 West Rice St. Estimated cost \$100,000
- Joliet-Blockson Chemical Co., Patterson Rd., has awarded the contract for an addition to its plant to include rilos and miscellaneous structures, to E. H. Swenson, 14 Henderson St. Estimated cost \$225,000
- Ind., Indianapolis-Paper Manufacturing Co. 5th and Willow Sts., Philadelphia, Pa., has awarded the contract for a 1 story, 180x220 ft. factory to Industrial Development Corp. 966 North Meridian St., Indianapolis. Estimated cost \$160,000
- Ky., Brandenburg-Mathieson Chemical Corp. Whitaker Bldg., Baltimore, Md., has awarded the contract for the design and construction of a plant for the conversion of natural gas byproducts to hydrocarbon chemicals, Stone & Webster Engineering Corp., 90 Bway., New York, N. Y. Total estimated cost \$13,000,000
- Louisville-National Distillers, 130 Bway., y, Louisvine—National Distillers, 170 Bway, New York, N. Y., has awarded the contract to design and construct 3rd unit at Old Grand Dad Distillery, to Sanderson & Por-ber, 52 William St., New York, N. Y. Esti-mated cost \$600,000
- La., Lake Charles--Jefferson Lake Sulphur Co., c/o Freeport Sulphur Co., Freepore, will construct a reliphur mining plant with own forces. Estimated cost \$150,000
- Minn., St. Paul-Waldorf Paper Products Co., 2250 Wabush Ave., has awarded the contract for a 1 story, 121x563 ft. warehouse to J. S. Sweitzer & Son, 739 Pillsbury Ave. Esti-inated cost \$400,000
- N. C., Acme—Riegel Paper Corp., c/o J. E. Sirrine Co., Engrs., 215 South Main St., Greenville, S. C., has awarded the contract for a paper pulp plant to C. M. Guest & Sons, Greensboro. Estimated cost \$13,500,
- , Cleveland-Industrial Rayon Co., 660 Union Commerce Bidg., has awarded the contract for an addition to its plant to Geo. A. Rutherford Co., 2725 Prospect Ave. Estimated cost \$500,000
- Rossford-Libbey Owens Ford Glass Co., Nichols Bldg. Toledo, has awarded the con-tract for a 1 story factory for the manufacture of Thermopene, also improvements to present Thermopane plant and new gate house to A. Bentley & Sons. Co., 201 Belmont Ave., Toledo. Estimated cost \$1,500,
- III., Chicago—Glidden Co., 5161 Moffat St., Pa., Bethlehem—Allentown Bethlehem Gas has awarded the contract for a laboratory Co., 512 Hamilton St., Allentown, has

- awarded the contract for a cyclic estalytic reforming plant to United Engineers & Con-structors, Inc., 1401 Arch St., Philadelphia. Estimated cost \$850,000
- Pa., Chester-Scott Paper Co., foot of Market St., has awarded the contract for a 1 story, 180x400 ft. warehouse to Irwin & Leighton, 1505 Race St., Philadelphia. Estimated cost \$500,000
- Tex., Baytown-J. M. Huber Corp., Borger, has awarded the contract for a carbon black plant to Stearns-Rogers Mfg. Co., First Natl. Bank Bldg., Houston. Estimated cost \$1,500,000
- Tex., Dallas—United States Envelope Co., 21 Cypress St., Springfield, Mass., has awarded the contract for an envelope manufacturing plant to the Austin Co., 5331 Mockingbird Lane, at \$775,000
- Tex., Dunas-Potash Co. of America, Carla-bad, N. M., has awarded the contract for the construction of a plant for the manu-facture of potassium sulfate and hydrochloric acid to Steams-Roger Mfg. Co., 1720 California St., Denver, Colo. Estimated cost \$750,000
- Tex., Fort Worth-Premier Oil Refining Co., Mt. Olivet Rd., has awarded the contract for the construction of a new platforming unit (processing unit) to Universal Oil Prod-ucts Co., 310 South Michigan St., at \$465,
- Tex., Pasadena-Sinclair Rubber, Inc., Pasadena, has awarded the contract for remodeling and reconditioning its rubber plant to Lummus Co., Pasadena. Estimated cost \$375,000
- Tex., Tyler—McMurrey Refining Co., Tyler, has awarded the contract for modernizing and enlarging its refinery to Refining Engi-neering Co., Wright Bldg., Tulna, Ohla. Estimated cost \$355,000
- Ten., Port Arthur-Gulf Oil Corp., Gulf Bldg., Houston, has awarded the contract for the construction of a fluid catalytic petroleum refining unit to M. W. Kellogg Co., 225 Bway. New York, N. Y. Estimated cost \$8,000,000
- Tex., Snyder-Standard Oil Co. of Texas, City Natl. Bank Bldg., Houston, will construct a ensinghead gasoline plant. Work will be done by owners. Estimated cost \$900,000
- Que , Donnacona Donnacona Paper Co., Ltd., Donnacona, will construct a plant addition by day labor under supervision of Edward Franklin c/o owner. Estimated cost \$750,

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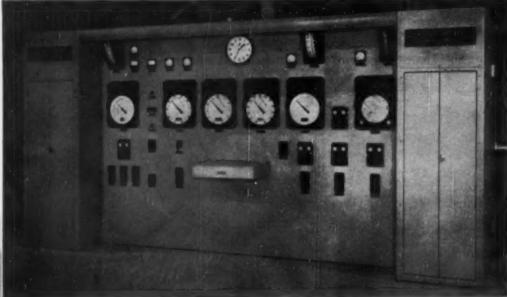
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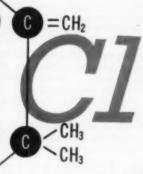
CHEMICAL MILLING AND PROCESSING EQUIPMENT

PROBLEM ...

... to develop a low-cost, highly potent toxicant for an insecticide that would help Southern farmers reduce the millions of dollars of damage done to their cotton annually by both weevils and other insects.

SOLUTION ...

. . . toxaphene — stemming from Hercules' continuing research in terpene chemistry plus long experience with organic chlorination. Toxaphene is made by chlorinating camphene to a chlorine content of from 67 to 69 per cent. First, camphene is made by isomerizing alpha-pinene, a major constituent of turpentine, which Hercules extracts from Southern pine wood.



Photograph shows one of Hercules' chlorinators at work. Superimposed is the structural formula of

HERCULES SYNTHETIC RESINS - CELLULOSE PRODUCTS - TERPENE CHEMICALS

What Next in Terpene Chemistry?

Team research on camphene and chlorine produced toxaphene. The experience of three decades of terpene chemistry, working with the hydrocarbons, alcohols, ketones, and ethers found in pine wood, has helped to enlarge greatly the uses of terpene materials.

Once used principally for their flavoring and perfuming values, today Hercules terpenes are still a source of perfumes—but they are also widely used in disinfectants, flotation agents, paints and varnish, solvents and thinners, laundry aids, textile processing aids, cleaning compounds, essential oils, soaps, and others.

You may not be directly concerned with insecticides, but what Hercules has done or is now doing to develop new and better uses for the many derivatives of the Southern pine could have an accelerated effect on your product development program. Hercules welcomes the opportunity to put its long experience in terpene and rosin chemistry to work for you.

HERCULES POWDER COMPANY 982 Market Street, Wilmington, Delaware Sales Offices in Principal Cities

RESULT...

... economical insecticide dusts and sprays that have reduced losses from harmful insects. Toxaphene-base insecticides are now recommended for control of cotton insects, grasshoppers, and many other insect pests that destroy crops. Farmers will use many millions of pounds this year.





When The Heat's On

Hercules Pentalyn[®] K, based an a new polymeric reain acid, is new available in quantity. "Pentalyn" K is an ester of pentacythritol. It combines an unwadily high softening point with excellent solubility, and low viscosity in low-cost alliphotic solvents. Softening point (Hercules Drop Method) 190°C; softening point (Ball and Ring) 172°C; adid number 20. It is broadly compatible with waxes, and natural or synthetic rubbers.

The unusual combination of advantages inherent in "Pentalyn" K make it particularly useful in heart-set printing links and in rubber based adhesives where strength and demination resistance is required at elevated temperatures.

New Ether-Ester Acetate

A new Hercules collulose product, Hydraxyethyl Cellulose Acetate—a triacetate—is now available on a limited commercial scale.

This new either-ester offers a whole new range of properties, substantially different from those offered by cellulose accitote. For example, solubility in acatone. Made in tosteless flake form, it is coloriess and adoriess, soluble in 1-4 diameter, ethyl acetate. I -nitro prepane, chlorinated hydrocarbons, and mixtures of the last named with alcohols. It is insoluble in alcohols, higher esters, all-phatic hydrocarbons, greases and water.

Films of the new material have good tensile strength, elongation and flexibility, offer better water resistance than cellulose triacetate, plus superior weather resistance.

Potential uses for the new triacelate may be found in the manufacture of protactive contings, printing links, artificial bristles and fibres, or in the making of wrapping or photographic film, and light transmitting reinforced window glazing for solaria, hen house and sufety areas.

Variety of Uses for Amines

Harcules Rosin Amine D - a primary amin consisting of a mixture of dehydro-, dihydro-, and tetrahydro-abietylamines -is finding a widening field of use in industry. The commercial product is a pole-colored, viscous liquid; density at 25°C., 0.997; boiling point (760 mm.), 344°C., neutralization equivalent, 310-320; purity, 89-93%; soluble in organic solvents, insoluble in water. The major uses for Rosin Amine D and its derivatives are flotation of nonmetallic area. corresion inhibitor, asphalt additive, preservative for starch, proteins, and cellulose. Also it and several of its derivatives show promise as fungicides and bactericides for preservation of wood and other callulose products.

COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER BASE ALLOYS

Prepared by Bridgeport Brass Company



Headquarters for BRASS, BRONZE, and COPPER

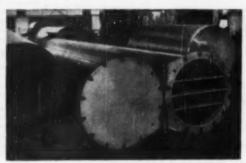
Duplex Tubes Boost Efficiency of Waste Water Heat Reclaimers

Many valuable sources of heat have been overlooked for a long time. Now reclamation and reuse of heat which was normally wasted is spreading quite rapidly to industrial fields as an effective means of cutting costs. This practice, however, has been long used in power, petroleum and chemical processing operations.

For example, Duplex Tubing (steel inside and copper outside) is playing an important part in the transfer of heat from waste water to fresh water used in mill

bleaching processing.

Four waste-water heet reclaimers are utilized in system illustrated above designed to reduce fuel consumption



Waste water heat reclaimer used at a bleachery is one of four in system designed to reduce fuel consumption and relieve over-loaded boilers-Courtesy Patterson-Kelley Co., East Stroudsburg, Penns.

and relieve over-loaded boilers. They are single-unit, closed-type, multi-pass construction on both tube and shell side.

High velocity waste water contain, ing caustics passes through the tubes and soft fresh water at controlled velocity through the shell side.

1610 Gallons Heated Per Minute

The total overall heat recovery of the four units is theoretically set at approximately 4.5 million BTU's per hour. This is equivalent to approximately 47,000 lbs. of steam per hour at 100 lb. pressure which would ordinarily be used for heating the 1610 gallons of fresh water passing through the reclaimers per minute.

Steel-Copper Duplex Selected

Since the analysis of the waste water indicated a high caustic content, steel was selected for the inner section of the Duplex Tube. Copper was used to the fresh water side because the type of water involved would have attacked the steel quite rapidly. At the same time Duplex Tubing (copper-steel) increased the heat transfer characteristics of the units above what would have resulted with single-walled steel tube.

A better heat transfer rate of this Duplex Tubing also resulted in a more efficient unit as compared with a similar unit with single-walled steel tube.

Heat Transfer Tests

To test the heat transfer of the mechanical bond use the Bridgeport's Duplex Tubing, tubos of the same material were drawn together in the same manner as used for duplex. These Duplex-walled tubes were compared with single-walled tubes of the same dimension. The tests showed that the mechanical-bonded tubes gave identically the same heat transfer value as for single-walled tubes (see table).



Workmen making up tube bundle with Dupler Tubing (copper-steel) for waste water heat reclaimer-Courtesy Patterson-Kelley Co., East Stroudsburg, Penna.

RESULTS OF HEAT TRANSFER TESTS DUPLEX VS. SINGLE WALL TUBING

Steam Condensed on Outside Surface With Fresh Water Passing Through The Tubes

	OVERALL HEAT TRANSFER RATE AT INDICATED WATER VELOCITY BTU/HR/SQ. FT./* F.			
Water Velocity Feet per Second	Duples Tubing **A** O.D. n Wall Thicknesses 0325** and .0325**	Regular Tubing %" O.D. x Wall Thickness .065" Steel .180 450		
21/5 31/2	Steel to Steel 371 458			
21/2 31/2	Copper to Copper 580 750	Copper 600 740		
21/2 21/2	Steel to Copper 465 625	Steel 380 438		

BRIDGEPORT BRASS

BRIDGEPORT BRASS COMPANY, BRIDGEPORT 2, CONN.

ESTABLISHED 1865

Mills at Bridgeport, Connecticut, and Indianapolis, Indiana . Is Canada: Noranda Capper and Brass Limited, Montreal

American Blower - a time-honored name in air handling



In Cincinnati, as in other cities, American Blower Air Handling Products serve commerce, industry and public utilities. For air handling data in the Cincinnati area, call American Blower—Parkway 8160. In other cities, consult your phone book.



Look before you buy. Comparison tests prove the superiority of American Blower Products. There's a big difference in quality, design, quietness, operating costs and efficiency between American Blower and other air handling equipment.

Air is free ... use it profitably!

In selecting air handling equipment for a wide variety of jobs, today's buyers must have a keen sense of values.

For they must determine where to draw the line between "priced" products and quality products. And their good judgment can well result in savings of theusands of dollars later on.

American Blower has built an enviable reputation for building only the highest-quality products. These products reflect a background of over 60 years' experience in the field of air handling. They are the results of the broadest and most thorough methods of engineering and research known.

If you would like to know how American Blower Products can profitably be applied to your business, phone the nearest American Blower Branch Office, or ask your Heating, Ventilating and Air Conditioning Contractor.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of Angeress Reptaton & Standard Sanitary consession

YOUR BEST BUY

AMERICAN BLOWER

AIR HANDLING EQUIPMENT

~ Serving home and industry

AMERICAN-STANDARD - AMERICAN BLOWER - CHURCH SEATS - DETROIT LUBRICATOR - KEWANER BOILERS - ROSS HEATER - TONAWANDA IRON

You can't beat these drums!

Your product may be one of the thousands of items for which a fibre drum is just about the perfect package. And there are some thumping good reasons why a Continental fibre drum is the best drum you can use.

Continental fibre drums can't be beat for rugged durability. They give extra protection to both expensive and dangerous articles for shipment either in this country or abroad. The closures are tight and strong —but easy to open and close.

Continental fibre drums can't be beat for shipping economy. Their light tare weight means savings at today's high freight rates—even greater savings on export shipments to countries where import duties are levied on the gross weight.

Continental fibre drums can't be beat for appearance. They are neat and trim, tailored to your product, and feature quality printing or spray painting. Each Continental drum is a style leader in its field.

Most important, Continental can't be beat for service. There are four strategically located Continental fibre drum plants ready to give you fast, economical and dependable service. Continental packaging engineers are always ready to give you sound advice on packaging problems. Backing up these engineers is a modern laboratory staffed with qualified research and development people.

Continental is big enough and flexible enough to handle any situation. Again and again Continental customers say, "You make us feel as though your fibre drum department is part of our own company." We'd appreciate an opportunity to show you how much real help and service we can deliver.



FIBRE DRUM DIVISION . VAN WERT, OHIO

New York • Philadelphia • Pittsburgh • Tonawanda • Cleveland Chicago • St. Louis • Los Angeles • San Francisco • Eau Claire

Ladish Elbows

36" STD. LADISH MAD

THROUGH 36 INCHES

...A Complete Size Range Another Reason to Specify Controlled Quality

SEAMLESS WELDING FITTINGS

From the small fitting that weighs several ounces to the half-ton giant... whatever your fittings requirement, the Ladish line provides you with an unrestricted choice of sizes in a complete range of types, weights and materials. In addition, every fitting offers the added dependability assured by the high manufacturing and metallurgical standards of Ladish Controlled Quality.

THE COMPLETE FITTINGS LINE
PRODUCED UNDER ONE ROOF... ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN

DISTRICT OFFICES New York + Buffalls + Penburgh + Philadelphia + Cleveland + Chicago

Uniform in appearance and performance



Shown here is one of the many massive drum dryers producing Wyendotte Kreelon flakes. Samples are regularly taken for a constant check on uniformity and other qualities.

Light, free flowing Wyandotte Kreelon

You can count on the uniformity of Wyandatte Kreelan*—month in, month out. That's because Kreelan is made under the most rigid manufacturing specifications.

This exceptionally fine synthetic detergent contains a minimum of 40% active agent. Wyandotte Kreelon is lighter in color and wets out faster than most other detergents . . . forms sparkling, clear solution.

Because of its unique chemical properties and purity, it dissolves with

remarkable speed and thoroughness. Its lack of odor has made it increasingly acceptable to discriminating manufacturers of cleaning compounds.

For maximum detergency, specify Wyandotte Kreelon (in free flowing flakes or powder). If you'd like further information on its properties and applications, why not write us today?

*Reg. U. S. Pat. Of.

Wyandotte Chemicals Corporation
Wyandotte, Mich. • Offices in Principal Cities

SODA ASH • CAUSTIC SODA

BICARBONATE OF SODA

CALCIUM CARBONATE • CALCIUM CHLORIDE

CHLORINE • HYDROGEN • DRY ICE

SYNTHETIC DETERGENTS • GLYCOLS

CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE

PROPYLENE DICHLORIDE

AROMATIC SULFONIC ACID DERIVATIVES

OTHER ORGANIC AND INORGANIC CHEMICALS





Let's start to summarize:

You can obtain Wolverine condenser tube in any copper base alloy that will meet your particular requirements and working conditions. Here is the list available from our Mills.

Copper Admiralty Arsenical Copper Cupro-Nickel 30% Cupro-Nickel 20% Red Brass Cupro-Nickel 10% Aluminum Brass Aluminum Branze Nickel Aluminum Branze Muntz Metal

Our Engineering Department is always ready to help you determine the proper alloy that will perform best under the conditions that prevail in your operations.

2nd

The tube can be delivered to you in a wide range of diameters and lengths . . . Diameters range from 1/4 to 2 inches.

In our next message to you we shall emphasize more reasons why it pays to specify Wolverine condenser tubes, and why Wolverine should be considered in any contemplated tube purchases.

Send for Our Condenser Tube Brochure

WOLVERINE TUBE DIVISION

Calumet & Hecla Consolidated Copper Company

MANUFACTURERS OF SEAMLESS, NON-FEEROUS TUBING

1427 CENTRAL AVENUE . DETROIT 9, MICHIGAN



PLANTS IN DETROIT AND DECATUR, ALA.
Sales Offices in Principal Cities

The Safe Choice for Hazardous Locations **EXPLOSION-PROOF MOTORS**



CLASS I, GROUP D DESIGN

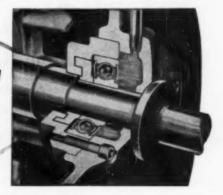


These special application motors are PRECISION-BUILT for safe operation in hazardous locations and manufactured to the standards of the Underwriters' Laboratories for Class I, Group D or Class II, Group F and G. With the addition of cable outlet, they will also meet the standards of the U. S. Bureau of Mines for use on permissible equipment.

An "extra" of vital importance in many locations is the high degree of corrosion-resistance provided by such features as monel name plates, grease pipes and shaft "slingers" and heavy, non-sparking bronze fans. In addition, all joints are sealed, all fits precision-finished, all cap screws made of heat-treated steel and immersed in asphaltum before assembly. Write today for Bulletin C-130 which gives further information you will want to have on Reliance Explosion-Proof Motors, or phone your nearest Reliance representative.

. . . an explosion-proof design for the **RELIANCE PRECISION BEARING MOUNTING!**

The Reliance Precision Bearing Mounting which has proved so successful in providing longer bearing life is made explosion-proof through a lengthened path from the bearing to the inside of the motor. Illustrated at right: Cross-sectional view of front end bearing, frame 204.



Sales Representatives in Principal Cities

ELECTRIC AND

1062 Iveship Road.

MILESTONES ... in ION EXCHANGE

1912 The Permutit Company was founded to pioneer the application of ion exchange to the treatment of water. This revolutionary process utilized the first synthetic zeolite or ion exchanger, Permutit M, a sodium aluminosilicate.

1918 Permutit developed a process for stabilizing and increasing the capacity of naturally occurring greensand glauconite. This material, sold as Zeo-Dur, is still the best material known for certain applications.

1935 Permutit produced the first commercial organic cation exchanger...Zeo-Karb. This material was the first that could be operated on both the sodium and hydrogen cycles.

1937. Permuit manufactured the first resin type ion exchanger, Demineralite, for removing anions from solution. The first commercial demineralizing installation was made employing this material in conjunction with hydrogen regenerated cation exchanger to produce the chemical equivalent of distilled water.

1943 Permutit made the first mixed bed demineralizing unit for the Armed Forces.

1944 Permutit developed and produced for the Armed Forces an ion exchange material for making potable water from seawater.

1946 Permutit was again first with the announcement of a highly basic anion exchanger, Permutit S, and introduced the revolutionary process for making silica-free demineralized water.

1950 For the latest in ion exchange research, look to the world's sole manufacturer of all types of ion exchangers and equipment.

Send for full information about these or any other ion exchangers and the equipment for their use to The Permutit Company, Dept. CE-9, 330 West 42nd Street, New York 18, N.Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal, Canada.



PERMUTIT

WATER CONDITIONING HEADQUARTERS FOR OVER 37 YEARS

... Hookup for trouble-shooters

Portable pressure gauges like this are used for testing and trouble-shooting. They must be easy to connect and disconnect quickly. The connecting tubing must remain tight despite severe and repeated flexing and abuse.



Bristol Series 500 Recording Pressure Gauge fitted with American Flexible Metal Tubing, synthetic covered.

In this case, the American Flexible Metal Tubing carries the medium tested (gas, vapor or liquid), instead of serving as armor over capillary tubing. The illustrated full interlocked flexible metal tubing, synthetic covered, meets this complicated and difficult assignment with ease and assurance.

There is a style of American Flexible Metal Hose and American Seamless Flexible Metal Tubing to convey nearly every fluid or gas over widely varied conditions of temperature, pressure or mechanical stress. For full information, write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.



American

FLEXIBLE METAL HOSE AND TUBING



to 11/2 inch or 3/4 inch in one operation

In one operation! That means not only a saving in machinery, less depreciation by wear and tear, but the additional savings of foundations, conveyors, drives and buildings. Because the Super-Slugger is a heavy duty hammermill that can crush power shovel loaded rock down to feed size for fine grinding or to commercial crushed stone. Built to do a giant sized job because it's heavily reinforced at all parts subject to shock and wear ... with extra heavy manganese steel liners. Shafts of unusually large diameter. The Super-Slugger is a real payload and profit builder! For detailed information write for bulletin 634.

WILLIAMS PATENT CRUSHER & PULVERIZER CO. 800 ST. LOUIS AVENUE ST. LOUIS 6, MISSOURI

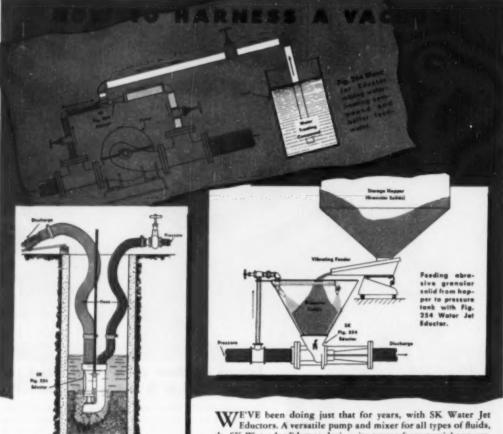
WC-48-4

Feed opening 41"x 30" to 51"x 81". Hammer blows 10,800 blows per minute in the smallest size, each blow 1,285,200 foot pounds to 17,280 blows per minute in the largest size, each blow 2,893,760 foot pounds. Size of product quickly changed by using grates with smaller openings.

WILLIAMS ALSO MAKES-

Heavy-duty hammermills in smaller sizes for all quarry operations; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "package" crushing and grinding plants.





Clearing sludge out of tank with portable Fig. 224 Mud Eductor.



New Bulletin 2-M describes all types of Water Jet Eductors, with specifications and applications. Write raday for your capy. WE'VE been doing just that for years, with SK Water Jet Eductors. A versatile pump and mixer for all types of fluids, the SK Water Jet Eductor derives its power from partial vacuum. Vacuum, formed in the suction chamber of the Eductor, is created by the action of the pressure liquid.

Putting that vacuum to work for you-at a saving-is our business.

The three examples above show how SK Water Jet Eductors are making tough jobs easier in a variety of industries. Since Eductors have no moving parts, maintenance and operating costs are extremely low. And their reliability makes SK Water Jet Eductors ideal for minimum supervision in hard-to-reach installations.

SK engineering can tailor a standard or special Water Jet Eductor to your problem. Mixing, blending and pumping of liquids, gases, slurries or solids—creating vacuum or pressure—are all within our scope. And SK manufacturing can provide a Water Jet Eductor in the size and material you require.

New Bulletin 2-M describes SK Water Jet Eductors, from specifications to applications. Write today for your free copy, or for SK engineering assistance on special problems.

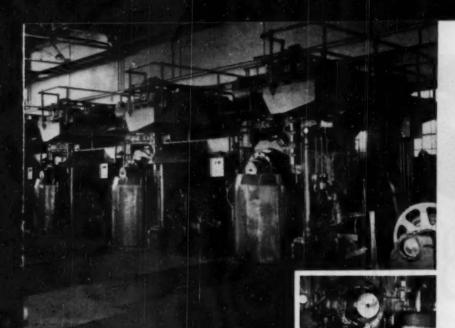


SCHUTTE and KOERTING Company

Manufacturing Engineers

1190 THOMPSON STREET . PHILADELPHIA 22, PA.

JET APPARATOS - NEAT TRANSFER EQUIPMENT - STRAINERS - CONDERSERS AND VACUUM PUMPS - DIE BURKING EQUIPMENT - ROTANIETERS - FLOW INDICATORS - RADIATIN TUDES - NALVES - SPRAY NOIZELES AND ATONIZERS - GEAR PUMPS - DESUPERNEATERS



Putting the "squeeze" on maintenance costs

In this modern 5-stand tandem coldrolling mill at a midwest steel mill, giant backup rolls squeeze strip steel to thousandths of an inch thickness. Taking the brunt of this punishing work are the end bearings on the rolls. Protection and proper operation of these bearings call for a lubricant that can really take it.

Recommended by a Standard Oil lubrication specialist, a STANOIL Industrial Oil has been used on these bearings for 1½ years of hard, continuous operation. Clean, effective lubrication, together with excellent maintenance practices by mill operators, has held bearing-upkeep costs to a minimum. The oil-circulating system, which includes two 6,000-gallon oil tanks, has remained entirely clean. STANOIL has shown practically no deterioration in use.

You can rely on this unique multi-purpose oil to give you the same, clean, dependable service in hydraulic units, speed reducers, and circulating systems. You can rely, too, on the expert, on-the-spot service of a Standard Oil lubrication specialist. How you can obtain his help, quickly and easily, is explained at the right.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.



What's YOUR problem?



Worren Erickson, Lubrication Engineer at Standard Oil's Chicago office, helped this midwest steel mill (see left) make important savings through the use of STANOIL Industrial Oil on a cold-rolling operation. He was close at hand, gave mill operators engineering service when they needed it.

There's a corps of Standard Oil Engineers and lubrication specialists throughout the Midwest. You'll find one located near your plent. You can reach him simply by phooing your local Standard Oil Company (Indiana) office. His experience and special training will help you get maximum benefits frum STANOIL and other outstanding products such as:

STANICUT Cutting Oils. These specialduty cutting oils meet today's most exacting requirements and highest poduction schedules. Grades vary in vacosity and compounding. Each contains the correct proportion of extrem-e-punsure and friction-reducing ingredients.

STANICOOL HD Soluble Oils. Because of additional compounding, these heavy-duty soluble oils possess the cooling abity of an emulsion and also give better tool life and finer finishes than do conventional soluble oils.

STANOSTAMP Compounds. These widely accepted products have demonstrated their ability to handle heavy stamping or drawing operations of low-carbon or alloy steels. Each of the three grades is a paste compound to which water can be added to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work, can be readily removed in conventional washing equipment.

STANDARD OIL COMPANY (INDIANA)





50-B PLASTICIZER

Barrett "ELASTEX" "50-B" Plasticizer is one of the most economical of all quality plasticizers. Compounds prepared with this plasticizer possess desirable properties such as ... water resistance... stability to discoloration under heat and light... toughness... oil resistance... firm hand... tear resistance... low migration... good electrical properties... excellent compatibility.

Profitable uses for Barrett "ELASTEX" "50-B" Plasticizer are suggested by the following formulations:

THE BARRETT DIVISION

ALUED CHEMICAL & DYE CORPORATION 40 Review Street, New York 6, N. Y. In Canada: The Sarrett Company, Unit, 5351 St. Hubert Street, Montrool, Que

Vinyl Film, Sheeting and Extruded Products A typical formulation for low cost, good quality

A typical formulation for a superior quality product is:
Polyvinyl chloride resin. 100
"ELASTEX" "50-8" Plasticizer 10
"ELASTEX" 10-P or 28-P Plasticizer 22.5
Fatty Acid Ester 10
Tricresyl Phosphate 7.5
Stabilizer Blend 4

Plastisol Formulations

The following is a low cost, general purpose plastisal formulation in which "ELASTEX" "50-8" Plasticizer is used as a partial replacement for the octyl phthalates. Plasticizer cost is reduced, and at the same time the flow properties of the plastisal and the oil resistance, water resistance, and tear resistance of the film are improved.

the film are improved.	
Paste resin	100
"ELASTEX" "50-B" Plasticizer	30
"ELASTEX" 10-P Plasticizer	20
Fatty Acid Ester	20
Stabilizer Blend	2

4 Reg. U. S. Pas. Off.

286

172



Hold Everything!

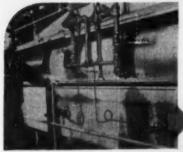


with Sarco.

TR-21
REGULATORS

HOT

For 20 Years



PROCESS TANKS

No process requires closer regulation than the various tanks in an automatic plating machine. In the plant illustrated, everything is automatic because all temperatures are controlled to within a few degrees by Sarco. The owner reports greatly increased production with practically no rejects and a considerable reduction in the amount of steam used.

The hot water in this large hotel was held at exactly the right temperature with the Sarco TR-21 regulator illustrated. During all this time there were no complaints because the water was too hot or too cold; and, of course, no heat wasted. Recently a wrench was put on the regulator for the first time and a few dollars worth of new parts installed. Now they look forward to twenty more years of service and saving



CAN COOLING

Production Speed-Ups

Better Production

Here is a can cooling operation which moves warm cans of fruit through a cooler on a conveyor. When operated by hand, water was wasted to be sure the temperature was safe. Even then, cans sometimes came out too warm and food was wasted. Now, with the same TR-21 regulator shown above, less water is used and no food lost. Ask for Sarco Catalog No. 600.

SARCO SAVES STEAM

SARCO COMPANY, INC.

Empire State Building, New York 1, N. Y.
LARCO CAMADA, LTD., TORONTO S, COTAMO

IMPROVES PRODUCT QUALITY AND OUTPUT

SINGLE BEAM direct **Transmittancy** recording

with BECKMAN infrared spectrophotometers

NEW SINGLE BEAM SYSTEM IS SIMPLE, ACCURATE, RELIABLE

The Beckman Single Beam Direct Transmittancy Recorder employs the memory solvent-filled absorption cell. During this run the signal from the photoreceiver is automatically maintained constant, and the resulting slit width vs. wavelength function is "memorized" on a wire recorder. The sample is then placed in the same cell, and information played back from the wire recorder automatically controls the wavelength and alit drive motors to reproduce precisely the conditions which produced the constant 100% reference level. Any absorption resulting from the sample is accurately and automatically recorded directly in transmittancy. On repeat runs, the same reference wire in used, eliminating repetition of standardizing measurements.

Single beam transmittancy recording retains the excellent resolution, low stray Meht, high stability and drift freedom, and the wavelength accuracy of the well-known Beckman Spectrophotometers. Other advantages are summarized at the right.

THREE UNEXCELLED INSTRUMENTS FOR ANY REQUIREMENT

Beckman Single Beam Direct Transmittancy Recording is available either (1) as an accessory unit for direct installation on any Beckman IR-2 Spectrophotometer, or (2) with the IR-2 as a complete instrument, or (3) in the new unsurpassed Beckman IR-3 Spectrophotometer - the most versatile, most accurate, most complete - and by all

standards, the finest spectrophotometer money can buy, " For further information on these instruments write . .

Beckman Instruments, Inc., South Pasadena 14, California. Factory Service Branches: NEW YORK - CHICAGO - LOS ANGELES

Mandardization principle, using reliable electronic circuits instead of complicated mechanical-optical arrangements. It successfully combines the highest accuracy with the utmost in reliability and convenience. A standardizing run is made on the empty or

BECKMAN INSTRUMENTS

* As in all Beckman in-

IMPORTANT ADVANTAGES of the **Beckman Transmittancy Recorder**

- GREATER CONVENIENCE: The single-beam principle eliminates troublesome, time-wast-ing cell- and beam-matching problems.
- GREATER VERSATILITY: Greater versatility and simplicity and lower costs are assured since special cells and attachments need no be duplicated for use in a reference beam
- GREATER ACCURACY: The single-beam principle eliminates problems of moking a beam attenuator achromatic, linear and free of vignetting effects.
- MINIMUM STRAY LIGHT: Only those single beam instruments use a filter-type beam chapper, reducing stray light effects to a minimum (less than 2% at 15 microns with the IR-2).
- MINIMUM SCANNING TIME: Optimum recording efficiency is achieved because each spectral slit width is traversed in a time proportional to the response period of the recording system. Any other scanning rate loses either resolution, time or accuracy.
- MAXIMUM RESOLUTION: Sift width control has the advantage that the instrument is always working of maximum resolution for the chosen amplification and scanning speed.
- FLEXIBILITY OF CONTROL: Operating speed, resolution and chart scales can be easily varied over wide ranges. A single concessity varied over wide ranges as single concession time per spectral slift. FREX.IBILITY OF CONTROL: Operating speed, resolution and chart scales can be easily varied over wide ranges. A single conford adjusts scanning time per spectral shift width from 1 second to 12ll seconds by factled that the second speed is electronically controlled with no gear shifting needed to change scanning speed.

In addition to recording linearly in wa





ne best economi emineralise

National average chemical cost 15C per 1000 gallons (one hour's production)

An important to water pure de CHEMICALS, TEXTILES, DE

For the first time in years, yet are set to prove much on 85 percent. The lower much on 85 percent. The lower mate is made in the most approach to the problem. Instead of segments the first inpurities as in distilling. Penfield rev. the provincing the impurities (the lesser) from the There's as heating, no cooling, no trouble.

HOW IT WORKS—In the first cheeses of persons and the control of th

In low tend solide districts, the common cost of the Personal Process raise as low its 30 per land princes to beside which in high send collect arrows the cost man higher. In Telegraphic

PENFIELD MANUFACTURING CO., INC. 20 High School Avenue, Meriden, Conn.

Water Settening Resins für Industrial Use
Water Treeting Equipment für Every Purpose

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Money Back Guarantee

Postlerif Assestantening Cu., Inc.

28 Fing School Accesses, Members, Gonn.

Services Please quote on 1908 gallons
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Waiter Course

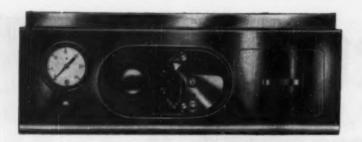
Wolfer constyle

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Your messes

Firm

Streat and City





has an external manual-automatic station

as mistake-proof as this

EXCLUSIVE mechanical interlock prevents switching into wrong position EXCLUSIVE "balancing" arrangement prevents "bumping" on changeover

Among the many features which have put the Bristol Series 500 Air-Operated Controller way out front is the unique External Manual-Automatic Station.

1. "Test" and "Service" positions are mechanically interlocked. Operator cannot, by mistake, go through "Manual" position into either "Test" or "Service."

2. Output pressures of the controller and the regulator on panel are measured by the same gauge. This enables operator to achieve exact balance before going from automatic to manual control or vice versa, thus eliminating the possibility of a "bump" to the process during changeover.

Bristol's External Manual-Automatic Station is an integral part of the controller installation ... yet can be used independently for manually controlling the process before the controller is installed or after it has been removed for any reason.

Read what else Bristol Series 500 Controller gives you . . . calibrated control, single service adjustment, reset stops, etc. Write for new Bulletin A120 on Series 500 Air-Operated Controllers, THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 20, Conn.



Engineers process control for better products and profits

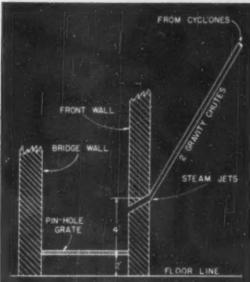
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

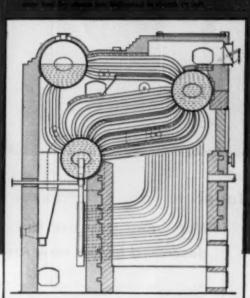
Riverside Mills turns



into







\$10,000 Annual Fuel Savings... Other Big Advantages... with NEW B&W BOILER

Burning refuse in a boiler—even primarily for disposal—isn't always easy. That's why there's big news in the modernized boiler plant operation at Riverside Mills, Augusta, Georgia—where an unusual kind of waste is being burned . . . efficiently . . . in a new Type H Stirling Boiler.

Problem: disposal of "motes" . . . refuse from the willowing, or cleaning, of cotton waste, consisting of leaves, dirt, and stalks, separated by screening from various by-products of cotton and wool manufacturing.

Plan: to dispose of the motes entirely by burning, and to utilize their heat content (about 1/8 that of coal, volume for volume) to generate steam.

Results: three to four tons of coal saved daily; complete disposal of motes; quick, trouble-free response to rapid boiler load swings; improved production.

Helping turn boiler plant problems into profits is an 80-year-old story with B&W. Perhaps its creative approach to-boiler engineering is just what is needed for a profitable solution of your steam-generating problems.

The Babcock & Wilcox Company, 85 Liberty Street, New York 6, N. Y.



Helping Industry Cut Steam Costs Since 1867

6-495



Some of the nozzles and laterals on this aluminum header have 1½-inch wall sections. Yet welding was easy with the methods described in this booklet. Joints are tight and smooth. Fabrication costs were low.

And note the simple wooden trestles supporting the assembly . . . dramatic evidence of aluminum's light weight and case of fabrication.

The equipment shown here is to be used in sub-zero production of oxygen... an ideal application for aluminum. For, the lower the temperature the better the performance you get from aluminum.

As temperatures drop from 75 degrees F. to minus 320 degrees F., Alcoa 3S alloy gains 23% in yield strength, 80% in elongation, and 67% in tensile strength.

If you want to know more about low-cost fabrication of aluminum, write for a copy of "Welding and Brazing A'coa Aluminum". You'll find it helpful. And if you are considering design of new equipment in which aluminum might improve performance and lower costs, our engineers will gladly consult with you. Write ALUMINUM COMPANY OF AMERICA, 1473.] Gulf Building, Pittsburgh 19, Pa.

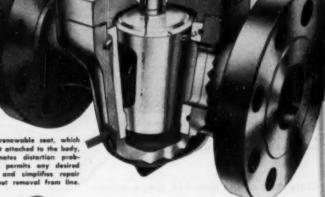
ALCOA ALUMINUM





NON-LUBRICATED LIFT-PLUG VALVES

is not attached to the body, eliminates distortion prob s, permits any desired



IDEAL FOR

Chemical Plant Pervice

~ CHLORINE

WHYDROFLUORIC ACID

√ CAUSTIC √ STEAM

V DOCTOR SOLUTION

VETHYLENE OXIDE

V SULPHURIC ACID

AND OTHER CORROSIVE PRODUCTS

NON-LUBRICATED-no grease of any kind required to effect a seal; prevents contamination of line products; and reduces chance for human error and need for maintenance.

PRESSURE SEALING-when plug is seated, line pressure automatically forces seat into tighter engagement with plug-body distortions do not affect the seal.

UNIQUE LIFT-PLUG ACTUATOR - a novel mechanical design which lifts, turns and reseats plug in continuous turn of a lever.

RENEWABLE SEAT AND PLUG-easily replaced; permits any desired trim for specific services.

REPAIRS ON THE JOB-can be completely overhauled without removal from line; no special tools or skill required.

EASY OPERATION-requires less operating effort than other valve designs.

FORGED STEEL-all parts, including body for most sizes, are press or drop forged from specification materials.

ameron IRON WORKS, INC.

P. O. BOX 1212 HOUSTON, TEXAS EXPORT: 74 TRINITY PLACE, NEW YORK, N. Y.

MBB Land Standard Sta

RELIABLE TROUBLE FREE A-B MANUAL STARTERS used in PHARMACEUTICAL PLANT

The Bulletin 609 manual motor starter is compact. Silver alloy contacts are closed and opened manually with two buttons—START and STOP—which actuate the switch with a quick make, quick break action. Overload breakers protect the motor.

In wet, moist surroundings, A-B starters in NEMA Type 4 waterlight enclosures give necessary protection to vital starter elements. Allen-Bradley Bulletin 609 manual starters are ideal for bolted enclosures... their double break, silver alloy contacts need no maintenance, hence, cover need not be taken off for frequent contact inspection.

Allen-Bradley Co. 1337 S. First St. Milwaukee 4, Wis.

Pills of different sizes and kinds are compressed in the tablet machine in the E. R. Squibb & Sons Company Mexican Plant. This machine is equipped with an A-B Bulletin 609 manual starter.

Only A-B offers you ALL these advantages in a manual motor starter

- . Simple construction-Only ONE moving part
- . Double break, silver allay contacts need no maintenance
- Millions of trouble free operations
- Dependable breakers provide accurate averload protection
- Overload breakers are quickly reset by pressing the STOP button
- White interiors and ample space for ease of wiring
- · A safe enclasure for every kind of job



Penicillin in production. In these wet surroundings, the A-B Bulletin 609 starter is enclosed in a NEMA Type 4 waterlight enclosure.



Bulletin 609 monuel motor starter in general purpose enclosure. Enviable reputation for reliable aperation.



Bulletin 609 manual starter in a NEMA Type 4 watertight enclosure.





THE SMOOTH FOLLOW-THROUGH OF THE TOURNAMENT WINNER

IT TAKES SEPARATION TO SPEED UP YOUR PROCESSING

So must processing be continuous if it is to be truly economical and fast these days. De Laval machines make most effective use of centrifugal force to speed up production and make interruptions unnecessary. Hours that once were required for settling or other inefficient methods of separation or clarification can now be cut to minutes or even to seconds by De Laval centrifuges.

De Laval machines are especially adapted to three classes of service -

- (1) the continuous separation of two liquids
- (2) the continuous clarification of one or two liquids
- (3) the continuous separation of two liquids plus the continuous removal of solids from one or both

Would any of these speed up your process?

THE DE LAVAL SEPARATOR COMPANY 165 Broadway, New York 6 427 Randolph St., Chicago 6 DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5 THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

CONTINUOUS

SEPARATION AND CLARIFICATION WITH CENTRIFUGALS

Enduro

STAINLESS STEEL

THRIFTY METAL OF 10,000 USES

No balfway moasurer inflice in the continuous of absolute sterility. This is the vasion for ENDURO Statuters Steel in more and more of the equipment of bospital, laboratory, obspectively and pharmacutical plant. Instruments, tables, cabinty, in a constant mast—are ENDURO: neutral mast—are ENDURO: neutral mast—are ENDURO: neutral applications.



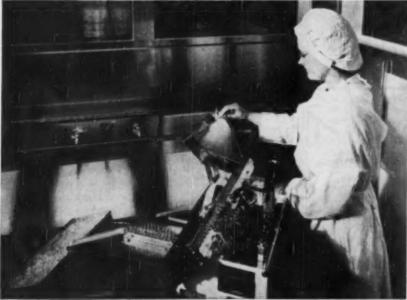


Photo Courtery Smith, Kline and French Laboratorie

SANITARY . . . TO THE LAST AMPULE

Sanitary?—To a point of perfection? Not only is this filling and sealing machine stainless steel throughout—the six by eight foot ampule-filling room itself is approximately fifty percent stainless steel lined, the remainder being tile and glass!

Why so much staidless steel? The answer would seem fairly obvious! Durability and raggedness—sanitation and ease of cleaning. There's nothing fragile about stainless steel. Its strength-to-weight ratio is very high. Accordingly, even in thin section it has great strength, rigidity and ruggedness. It takes punishment without showing it and without losing efficiency. As a result

there is great durability, very little maintenance, very long efficient life.

Its smooth, pore-free surface is as sanitary as glass and as easy to clean and keep clean. With its resistance to rust, corrosion, most acids and alkalis, to high heat and sub-zero cold, it welcomes sterilization under live steam or other means. Furthermore, there are no surface pores in which bacteria can hide.

Sanitary-practical-productive-profitable-ENDURO is a "natural" for equipment and work surfaces. Ask your equipment manufacturer or write us for further data.

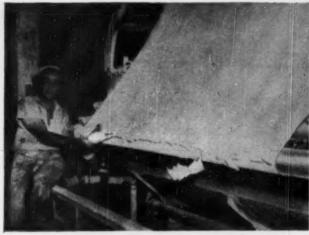
CHECK ALL 12 ADVANTAGES: Rust- and Corresion-Resistance • Heat-Resistance • High Melting Point • Low Coefficient of Expansion • High Strength • Good Dimensional Stability • No Metallic Contemination • Essy to Clean • Essy to Pobricate • Eye Appoul • Long Life • Low End Cost • What more can be desired in a material?



For Complete Details Write

REPUBLIC STEEL CORPORATION

Alloy Steel Division, Mussillon, Ohio . GENERAL OFFICES, CLEVELAND 1, Ohio . Export Dopt.: Chrysler Bidg., New York 17, N.Y.



HOW A SMALLER FEInc FILTER

Because it does away with costly slow-downs due to filter cloth blinding—and eliminates standages necessary to change cloth that's worn

Because it does away with costly slow-downs due to filter cloth blinding—and eliminates stoppages necessary to change cloth that's worn out by a scraper—the FEinc continuous (really continuous) rotary vacuum filter gives higher filtration rates per square foot with less maintenance—and that's what counts! For instance, these actual cases:

Two scraper-type filters handling black iron oxide ran partially blinded. The resulting mud was wet, due to the heavy blow-back which returned some filtrate to the cake in attempting to free the fine solids. The same job is now handled on just one FEinc, with no plugging, and dry cake.

Zinc axide formerly came off a scraper filter so wet it had to be shoveled onto an intermediate drum dryer. Now a FEinc string filter eliminates the intermediate dryer, drops cake directly onto the final dryer's conveyor.

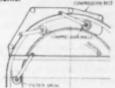
A porcelain plant reported costs reduced 59% by one FEinc continuous filter producing cake with uniform 17% moisture, as compared with four plate-frame presses formerly used.

Lighter, more efficient fabrics last longer on the FEinc String Filter, give you clearer filtrate, lower loss of solids. Then too, the FEinc compression mechanism removes 2-6% more moisture, and the FEinc submergence washing mechanism washes cakes down to unbelievable purity. Any combination of FEinc features can be engineered to your needs at reasonable cost. Ask for Bulletin 103.



Note how the FEinc String Discharge reinforces the filter cake and removes it from the filter drum in one continuous, easy-to-handle sheet.

FEinc compression mechanism, consisting of belt and rolls, gets more moisture out of cake than vacuum could do alone. Rolls seal cracks in cake which reduces vacuum requirements.



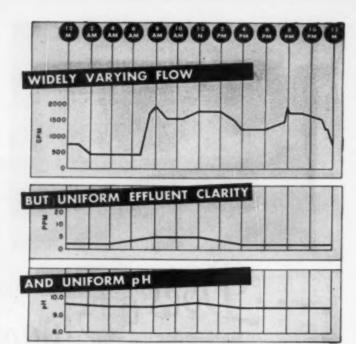
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FILTRATION ENGINEERS INC. 155 ORATON STREET . NEWARK 4, NEW JERSEY



A Day in the Life



GRAVER Reactivator

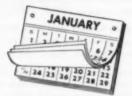
WATER CLARIFIER AND SOFTENER

The above graphs show the uniform results being obtained from a GRAVER Reactivator with widely varying flow at an installation treating a turbid surface supply.

Such results are typical of GRAVER Reactivators, for in installations throughout the country, these units maintain constantly higher clarity and quality of effluent through sudden or wide changes in flow rate and water consumption.

Highly efficient upflow clarification and softening is obtained due to the following exclusive design features . . . high rate sludge recirculation . . . upflow sludge filtration through a concentrated zone of accumulated precipitates . . . positive continuous sludge removal.

Write for catalog describing GRAVER Reactivators in detail, and ask for advice on your particular water problem. Specific recommendations from the long-experienced GRAVER engineers and chemists are offered without the slightest obligation.



It's the same story
DAY AFTER DAY
YEAR AFTER YEAR

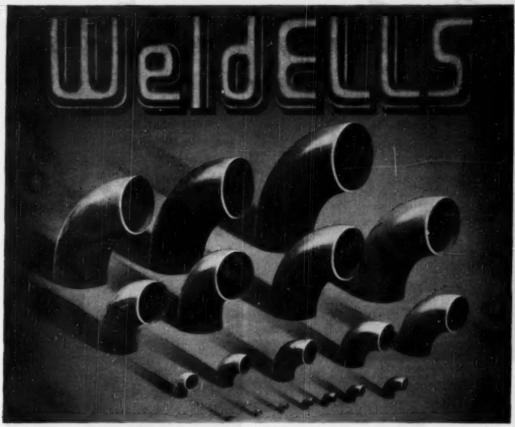


GRAVER WATER CONDITIONING CO.

216 West 14th Street, New York 11, New York, U. S. A.

CW 431

A DIVISION OF GRAVER TANK & MFG. CO. INC. EAST CHICAGO, IND.



Family Group ... proud of its size ... and traditions

Large group though it is, you see here only one branch of the world's largest family of fittings for pipe welding.

It is simply the stock sizes of long-radius WeldELLS in a single weight and material — merely a small fraction of the enormous line that includes more types of fittings, in more materials, more weights and more sizes than any other line.

Important though the breadth of the WeldELL line is to every man who designs or erects piping, still more important is the significant fact that the WeldELL family grew to this size because nothing less could meet the demand for fittings of WeldELL quality and uniformity to satisfy every conceivable piping condition.

Yes, there is a Taylor Forge Fitting for every purpose. From the smallest to the largest, every fitting in the WeldELL line shares the principle of sound engineering design and jobspeeding utility that Taylor Forge has consistently applied for half a century.

Mail the coupon for Taylor Forge catalog.

TAYLOR FORGE

TAYLOR SPIRAL PIPE is again promptly available in a broad range of sizes and thicknesses. Coupon brings new Spiral Pipe Bulletin 493.

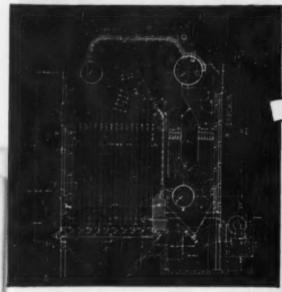


TAYLOR FORGE & PIPE WORKS

P. O. Bax 485, Chicago 90, Illinois Offices in all principal chies: Eastern Plant: Cornegle, Pa. Western Plant: Fantona, Calif.

NAME	-		
POSITION	-	 	
COMPANY	 		
STREET ADDRESS.			
CITY		ZOI	 TATE

Guick Steaming at all Ratings!



Carry high overloads with high efficiency

SPECIFY OUT

STEAM GENERATING

VL

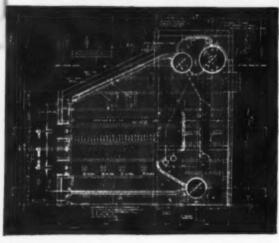
Two 27,500 pounds per hour units, instailed at Beown-Forman Distillers Corporation, Louisville, Ky, Features large furnace volume in limited space, with high ratio of radiant heating surface.

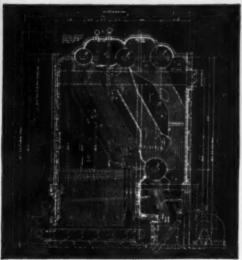
LASS

Mr. Carmel Public Utility, Mr. Carmel, Illinois, is surved by this 60,000 pounds per hour unit. Generous steam liberating surfaces and steam space permit wide fluctuations in load.

CLASS V/D

70,000 pounds per hour sream generator at Humble Oil and Refining Company, Johnson, Texas. An officient, high-duty unit with water cooled furnace, using getinary gas fuel.





Vogt builds a complete line of bent tube steam generators, designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Superheaters, air preheaters, economizers, water walls, and soot blowers can be readily incorporated. Bulletins with general information and showing typical installations are available upon request.

HENRY VOGT MACHINE CO.

LOUISVILLE 10. KENTUCKY

NEW YORK, PHILADELPHIA, CLEVELAND CHICAGO, ST. LOUIS, DALLAS





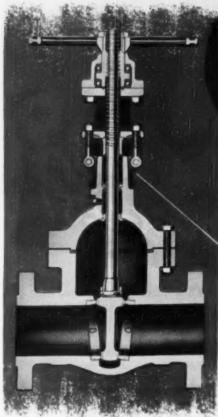








You'll benefit by using

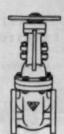


R.P.C.
CAST STEEL
VALVES

Note the quality features of this Gate Valve. They are typical of all valves in the R-P&C Cast Steel Line—gate, globe, angle and check valves in pressure classes 150 lb. through 1500 lb.

- Bull Bearing Operating Not permits smooth operation with minimum effort.
- One Piece Yoke with Cap provides rigidity, perfect alignment and easy access to operating nut.
- High Quality Packing assures a tight stuffing box under all conditions—low stem friction—minimum servicing.
- Gland and follower with Sall Joint applies uniform pressure on packing, prevents follower binding with stem.
- Heat-treated Stainless Steel Stem has high strength and corrosion lesistance.
 Polished surface increases life of packing;
 T-head makes strong, self-aligning connection with wedge.
- Selid I-Beam Wedge is guided to proper seating by guide ribs cast integral with the body. Wedge seating surfaces are precision ground to fit perfectly with body scat rings.
- Serrel-type Seet Rings have heavy, uniform section; offer no points of high stress concentration; have broad seating surface, ground smooth for less wear—longer life. Port opening is full pipe diameter.









In addition to the standard line,
R-P&C offers cast steel gate and globe valves
with Pressure Sealed Bonnet joint—especially
adapted for high pressure, high temperature
service. For information, get in touch
with your nearest R-P&C District Office.

Reading, Pa., Atlanta, Baltimera, Boston, Chicago, Danver, Detroit, Houston, New York, Philodolphia, Pittsburgh, San Francisco, Bridgepert, Cannecticul



R-P&C VALVE DIVISION AMERICAN CHAIN & CABLE





It's Compact -

It's Flexible -

It's Smooth-

New and simplified design results in new ease of control, together with positive drive and extreme ruggedness. Dodge Rolling Grip Friction Clutches provide trouble-free, dependable service on many thousands of industry's tough installations.

There are no toggles! Instead, the mechanism shifts smoothly on hardened steel balls—and has the positive grip of a wedge. Operating parts are completely enclosed for safety, yet quickly accessible for service.

DODGE MANUFACTURING CORPORATION, 200

Dodge Rolling Grip Friction Clutches are available from distributors' stocks in two types-Bolted Plate and Gear Tooth Mechanism-for service ranging from light machinery with smooth power source to heavier loads, in a range from 1/3 H.P. to 21 H.P. at 100 R.P.M. Selection of the right size is easily arrived at from Dodge Selection Tables. For complete data, including tables, call your Dodge Distributor or write us.

Call the Transmissioneer, your local Dodge Die Cert in Treasmentoness, your rocal polye Dis-tribute. He's factory-trained to help solve your power-drive problems. He has information on latest transmission developments. Lock for his name under "Power Transmission Machinery" is your classified telephone directory.

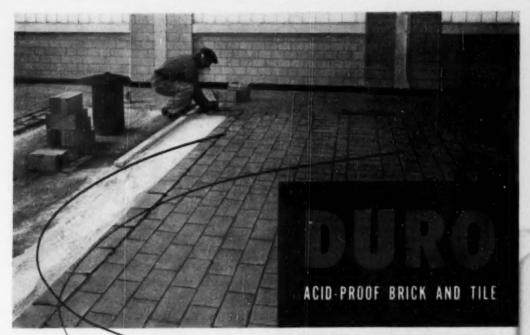
Union Street, Mishawaka, Indiana





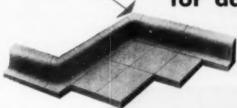
POWER . TRANSMISSION

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY.

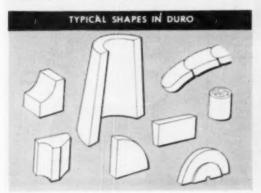


Amade by HARBISON-WALKER

for acid-resistant structures



H-W Duro Floor and Cove Tile are shown above. In addition to Standard 9" and 12" sizes, Duro is furnished in many special designs for chemical plant service, some of which are shown below.



For chemical plant floors, tanks, towers and other structures exposed to damage by acid and other corrosive liquids and gases, use Harbison-Walker DURO Acid-Proof Brick and Tile.

Duro Brick and Tile are so dense and nonabsorbent that there is practically no penetration by acids or other corrosive chemicals. The materials from which Duro are made are insoluble in acids and resistant to moderately concentrated alkaline solutions. Duro are well adapted for use at acid tower temperatures, and have high mechanical strength.

We will gladly send you an illustrated bulletin giving complete data, and showing many standard and special shapes.

Harbison-Walker Refractories Company

AND SUBSIDIARIES

WORLD'S LARGEST PRODUCER OF REFRACTORIES



GENERAL OFFICES PITTSBURGH 22, PA.

rode Mork Reg. U.S. Per. Off.

Let us

help you solve your SPEED REDUCER PROBLEMS

Farrel speed reducers have incorporated in them the experience gained in the solving of innumerable problems requiring considerable pioneering in gear engineering. The result is a wide range of types (a few of which are illustrated here), that are standard in principal features, but adaptable in critical detail.

All units are supplied with precision gears, generated by the famous Farrel-Sykes process for smooth, quiet, efficient power transmission; shafts and bearings factored to safeguard against interruption of vital processes; gear cases proportioned to withstand repeated heavy peak loads; joints sealed to prevent entrance of dust and dirt.

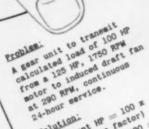
But, that is not all. Without sacrificing the advantages of general standards, the design of these units permits an engineering freedom in proportioning gears, shafts, bearings and even some housing dimensions to meet specific load, speed and service requirements. This flexibility has resulted in the solution of innumerable application problems.

Write for further details. Ask for a copy of Bulletin 449-no cost or obligation.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffolo, N. Y., Sales Offices: Ansonia, Buffala, New York, Baston, Pittsburgh, Airon, Cleveland, Clacinati, Detroit, Chicago, Los Angeles, Yulsa, Houston, New Orisans

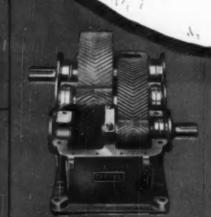
Farrel-Birmingham



Solution: HP Factor 6.03:1

Equivalent HP Factor 7.00 km for the factor for the facto









DOUBLE REDUCTION U

CELANESE* U.S.P. FORMALDEHYDE

Celanese U.S.P. Formaldehyde is a dependable highquality product—water white, uniform strength, low acid content, low metal content. Produced from natural petroleum gases at the Chemcel plant near Bishop, Texas, Celanese Formaldehyde is meeting the most rigid industrial requirements. Large volume production assures immediate and unfailing availability.

CELANESE SPECIFICATIONS

Write for newly published technical data booklet containing complete specifications, shipping and handling and other information. Celanese Corporation of America, Chemical Division, Dept. 46-E, 180 Madison Ave., N. Y. 16.





ACIDS . ALCOHOLS . ALDEHYDES . GLYCOLS . KETONES . PLASTICIZERS . SOLVENTS

Here's Why You Get LOWER Maintenance Costs with Chapman List 960

1. Gaskets!

Available with either metal to metal or gasketed joint as required.

2. 50% Stronger!

New design features compensate at points where excessive strain can develop . . . make stem and wedge gate connection 50% stronger than before.

3. Wear-Resisting Wedge Faces!

To keep your maintenance cost down the wedge faces are hardened to 800 Brinell by the exclusive Malcomizing process.

4. Replaceable Seat Rings!

When necessary, you can replace the seat rings easily . . . fast. Seat rings have wearresisting and non-galling properties . . . made extra hard for years more service.

5. Full Pressure Repacking!

No need for costly interruption of flow to repack.

But check this lower maintenance cost for yourself. Next time you buy specify List 960 in sizes from 3/4" to 2". Rising stem with yoke (as illustrated) or rising stem inside screw type. For pressure range 2000 lbs. at 100 deg. F., 380 lbs. at 1000 deg. F. Specify List 990 for higher pressures.

The CHAPMAN Valve Manufacturing Company

INDIAN ORCHARD . MASSACHUSETTS



dependable Heat that is economical-efficient-easy to use

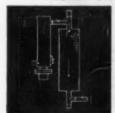
CHROMALOX ELECTRIC Circulation Heaters

for heating liquids
preheating fuel oils
heating compressed air
and other gases

Production costs go down . . . operating efficiency goes up when you install economical CHROMALOX Circulation Heaters. They give you measured quantities of heat, at temperatures up to 750° F. that can be rapidly reached and accurately controlled. Dependable, around-the-clock operation, minimum maintenance.

Uses include: Water heating applications such as steam boilers and accumulators; jacketed chemical kettles, tanks and processing equipment. Preheating fuel oils; heating Dowtherm, Aroclor, Prestone or heat transfer oils. Heating nitrogen, air and other gases, drying steam, plastic powders and other process work.

HERE ARE TWO TYPICAL APPLICATIONS



Heating Mitrogen to Reactivete Alumina



Heating Oil-Jacksted Kettle

CHROMALOX

Electric Heat for Modern Industry.

check these advantages of CHROMALOX Electric Heaters

- 1. Efficient heat when and where you need it.
- 2. Economical initial casts low installation and operating casts.
- 3. Accurate temperature control — thermostatically or manually regulated.
- Wide selection to most your specific heat requirements.
- Improved process, production and product with fewer rejects.

for more intermetion Weste for Catalog 50

It has complete data on many of the 15,000 Chromalox Electric Heaters and Equipment used in modern industry.



EDWIN L. WIEGAND	COMPANY
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Pittsburgh 8, Pa.	

Company
Street
City Zone

10-4

PLATE FABRICATION AND HEAT EXCHANGERS



tro-Static General S' 6" I.D. by 16 high.



Jocketed Nickel Clad Agitator Pressure Kettle —5' 0" diameter and 8' 0" high.

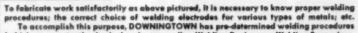
Storage type cooler for synthetic rubber plant . . of Nickel Clad Steel.

This vait is of 304 Stainless Steel. 10' 0" O.D. by 28' 6" long everall. Weight — 15,0008.

SPECIALIZING IS



Welding by



To accomplish this purpose, DOWNINGTOWN has pre-determined welding procedures (which are constantly checked and approved); a Welding Engineer, a Welding Supervisor, X-Ray and other technicions studying materials and methods.

Our experience and constant research in fabricating various grades of Carbon Steel, Stainless Steels, Nickel-Clad, Stainless-Clad, Monel-Clad, Cupre-Nickel, Aluminum, etc., may be of help to you. We are fully equipped with the most modern facilities to handle complete jobs, within our limitations, in the correct materials and methods of fabrication required to assure operating efficiency.

DOWNINGTOWN also maintains a Heat Transfer Division under the direction and supervision of men thoroughly trained and experienced in this field.

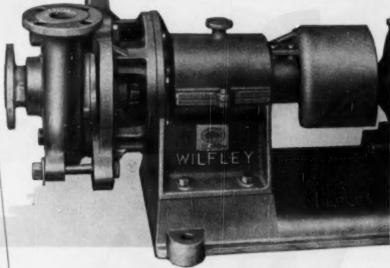
Engineering Consultation is of your service, to aid you in preparation of plans and/or specifications for definite jobs.

HEAT EXCHANGERS . WELDED AND RIVETED PRODUCTS

DOWNINGTOWN IRON WORKS - DOWNINGTOWN, PA.

NEW YORK OFFICE, 30 CHURCH STREET





WILFLEY Acid Pumps are on the job in modern chemical plants all over the world. Every day, they move hard-to-handle acids, corrosives, hot liquids and mild abrasives on a trouble-free, 'round-the-clock schedule. Actual production-line records show substantial dollar savings in stepped-up performance and low-cost operation.

Efficient, dependable WILFLEY Acid Pump; are available in 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. Individual engineering on every application. Write or wire for detailed information.

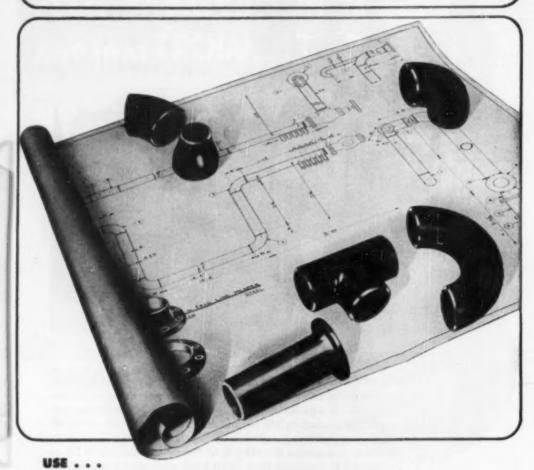
Buy WILFLEY for cost-saving performance

A. R. WILFLEY & SONS, INC., DENVER, COLORADO, U.S.A.

New York Office: 1775 Broadway, New York City

WILFLEY Acid PUMPS

TO DO A BETTER PIPING JOB . . .



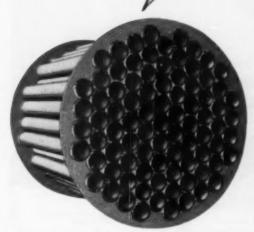
CLOBE PRECISION PROCESS

When you specify and use Globe Welding Fitings you have the product of an organization with unusually broad metallurgical experience. Globe's precision-process method of production reaches back to the manufacture of the Globe seamless tubes themselves which are the "raw material" of Globe welding fitting fabrication. GLOBE STEEL TUBES CO., Milwaukee 4, Wisconsin Chicago • Minneapolis • Cleveland • Detroit • New York • Philadelphia St. Leuls • Tulsa • Houston • Denver • Sen Francisco • Glendale, Cal.

Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — carbon — alloy — seamless steel tubes — Globeiron seamless high purity ingot iron tubes — Globe Welding Fittings.

Send for the Globe Welding Fittings Catalog-and look to Globe as a preferred source of supply.

Now You Can Reduce Tube Replacement with Carpenter ATF Stainless Tubing



Glass tubes fit concentrically inside of Stainless Tubes in this owne generating unit. Because tube replacement would be very costly, specifications fall for close limits on straightness, ovality and I. D. tolerances on the Stainless Tubing. That's why Carpenter Stainless Tubing is used for all osone units.

Tube replacement costs a lot. It costs time, plus labor and shutdown problems. That's why, on job after job, process engineers and fabricators are writing Carpenter on Stainless Tubing orders.

They know, from working with Carpenter Stainless Tubing, that the uniform walls in every length give a tight fit for pressure or vacuum jobs. They will tell you that there are no "off gauge" sections where corrosion could get a start.

You can prove to your own satisfaction that there is a difference in the Stainless Tubing that comes from your Carpenter Distributor's stock. Call today. You will get the kind of fast service you want, and the kind of Stainless Tubing that helps you cut down on tube replacement.

Stainless Tubing Data File gives you information on corrosion resistance, physical properties, sizes and gauges, etc. For your Carpenter Stainless Tubing Data File, just send us a note on your company letterhead.



THE CARPENTER STEEL COMPANY
Alloy Tube Division, Union, N.J.

Export Department: Woolworth Bidg., New York 7, N. Y. "CARSTEELCO"

Carpenter STAINLESS TUBING



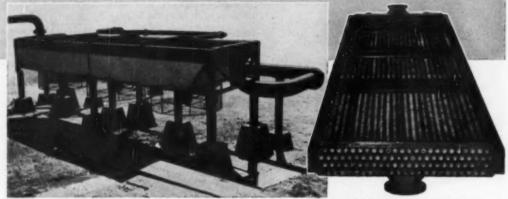
You get delivery when you want it. On mill orders you get a definite delivery promise within 24 hours. Call your Carpenter Stainless Tubing Distributor.



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Water Piping
Water Pumps
Water Treatment
Water Disposal
Water Freeze-Up
Water Corrosion

All these water problems and expenses eliminated by FIN-FAN
THE AIR-COOLED EXCHANGER



Single Fin-Fen Exchanger installed on the ground.

FIN-FAN . . . the Air-Cooled Condenser or Cooler developed jointly by The Griscom-Russell Co. and Fluor Corporation Ltd., compietely solves the cooling water problem . . . by eliminating the cooling water.

That's FIN-FAN benefit No. 1. FIN-FAN'S wide adaptability is its No. 2 benefit. These units are being used for cooling solutions, process liquids, lubricating oil, gear oil, quenching oil, petroleum fractions, jacket water, and compressed gases, and for condensing exhaust steam, hydrocarbon vapors, and refrigerating vapors. A single installation can be used for two or more cooling and condensing duties simultaneously.

And FIN-FAN has many additional advantages. It can be installed wherever convenient... within a building, on a roof, or on the ground. Its effec-

G-R K-Fin Air-Cooled Section used in the

tiveness is entirely independent of the direction or velocity of the wind. It can be operated by any available source of power. Its construction is particularly sturdy and durable, capable of withstanding high temperatures and pressures.

Write for Bulletin 1231 describing these many-purpose, many-benefit units in detail and for recommendations for your heat transfer needs.

THE GRISCOM-RUSSELL CO., 285 MADISON AVE., NEW YORK 17, N. Y.

GR-230

GRISCOM-RUSSELL

PRONEERS IN HEAT TRANSFER APPARATUS



How Darling features prevent trouble and expense



This obversament is one of a series showing how the unique Durling Fully Revolving Double Disc Parallel Seel Gate Valves answer the following critical operating problems:

- · Positive, way closing-reportfess. Automotic adjustment for valve budy
- . Elimination of disc-to-seet friction
- and galling. o Uniform weer distribution
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CORROSION RESISTANT VALVES -

In addition to conventional iron ling specializes in valves for any cor rosive fluid iron body valves with special alloy frim; iron body, rubber ling's 50 years of experience in meet ing unusual requirements is always

EXTREME SIMPLICITY



HAT'S all there are-just four simple, sturdy parts-two I plain interchangeable no-pocket discs and two husky wedges.

Note particularly that the discs are completely free of pockets. Sediment and scale cannot collect to interfere with their free movement. No links or other devices are needed to hold the discs and wedges together. Any part can be quickly and inexpensively replaced without removing valves from the line. Parts cannot be incorrectly assembled nor become disengaged while in service. Operation and maintenance are equally simple.

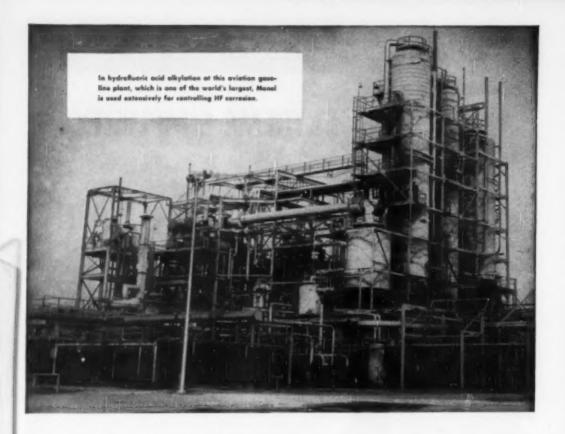
Darling valve users are money ahead because of the exceptional service made possible by the ingenious simplicity of the Darling design. These advances, coupled with Darling's modern precision manufacturing methods and advanced metallurgical practice, offer you valve performance at its finest . . . and at the lowest cost. Next time give Darling a try!

DARLING VALVE & MANUFACTURING CO. WILLIAMSPORT 3, PA.

Outline your service requirements and get complete information on Darling Valves of the proper type. Or, send for the complete 300-page Darling Catalog No. 17M. It de scribes Darling Valves of all types for every normal or unusual service, and for pressures up to 1500 pounds. It's full of belpful informa-tion ... Yours for the asking.



THE VALVE MARK OF QUALITY . . . WATCH FOR IT



Specify MONEL for handling HF and FLUORINE

Experience has proved that for maximum safety, and corrosion resistance, Monel® is among the most satisfactory materials of construction for handling fluorine and its more active compounds.

Monel is highly resistant to ignition by fluorine. It has been successfully used to handle fluorine at pressures up to 400 pounds per square inch, and has shown economical corrosion resistance at temperatures up to about 900°F.

Not only is Monel highly resistant to attack by fluorine, it also shows good corrosion resistance to anhydrous hydrogen fluoride and to steam-HF mixtures, even at temperatures as high as 1100°F. A proven practical application of these facts has been the established use of Monel in hydrofluoric acid alkylation units in petroleum plants.

In addition to these excellent chemical characteristics are Monel's well-known physical properties: high strength...easy fabrication and welding. Important too...Monel is readily available in all standard mill forms and fittings.

If your process requires the use of fluorine or fluorides, you will want to know more about Monel. For literature and additional technical data, write today.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street, New York S, N. Y.

MONEL ... for minimum maintenance

four typical flow-metering services of Hagan Ring Balance Dual Meters

The Hagan Ring Balance Dual Ring Flow Meter is in reality two meters, recording on a single chart, and housed in a single standard size meter case. This gives the advantage, not only of saving space, but of producing several related records on a single chart.

Both ring assemblies may be high differential, both may be low differential, or one may be high and the other low differential. Static pressures can be anything up to 15,000 psi. The recording mechanisms may operate independently, or they may be linked together to produce a combined record.

Four applications typical of flow measurements which are possible with this versatile meter are the

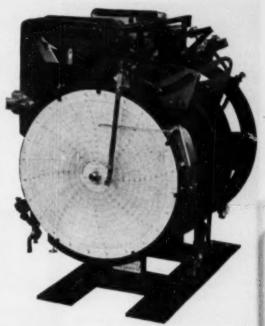
1. Measurement of Two Independent Flows— A direct record of the relation between two rates of flow may be shown on a single chart, as, for example, steam flow and air flow, or gas flow and air flow.

Independent Measurement of Two Flows, with Automatic Totalization—This may be used to produce records of flow from each of two boiler outlets or to a process having two inlets, with a third record and integration of the total flow.

3. Independent Measurement of Two Flows, with Automatic Subtraction—In the case of a split flow, measurements may be made of the main flow and of the flow through one branch, with records of these and of the difference, which represents the flow through a second branch. Any two of the flows may also be integrated automatically.

HAGAN CORPORATION

RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THRUSTORE FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS



One common type of Ring Balance Dual Meter is the Hagan Boiler Meter, shown above. Low pressure ring measures air flow, high pressure ring measures steam flow.

4. Automatic Correction of Flow Measurements on Basis of Liquid Gravity or Gas Density—With one element of the Dual Meter measuring flow and the second element measuring gravity of a liquid or density of a gas, records may be produced of the corrected and uncorrected flow rates and of gravity or density measurement, with automatic integration of either flow rate. Correction for temperature and pressure factors also may be made automatically.

For more detailed information, describe the particular application in which you are interested, or fill in the coupon. Mail to Hagan Corporation, Hagan Building, Pittsburgh 30, Pennsylvania.

Hagan Corporation Ring Balance Meter Division				
Hagan Building, Pittsburgh 3				
Please send me further infor Dual Meters.	mation on	Hagan	Ring	Balance
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City		State	CR	



You don't need a gypsy...

to foretell the future of this compressor!

Consider the evidence:

Gardner-Denver AA Compressors are known throughout the world for continuous service under all operating conditions.

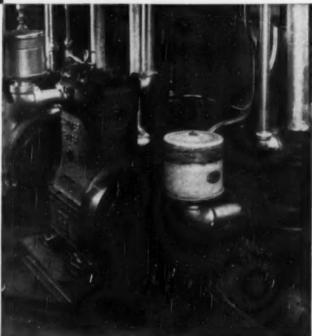
Look into the design:

Gardner-Denver AA Compressors are built to last, with quality features such as generous bearing areas, extra large water jackets and force feed lubrication.

You can safely predict:

A Gardner-Denver AA Compressor installed in your plant will assure a dependable source of compressed air for years to come — will save you money every year on both operation and maintenance.

Write today for complete information on AA service records and construction features.



Gardner-Denver AA Vertical, Single-Stage, Water-Cooled Compressor. Capacities from 32 to 183.6 cubic feet displacement per minute.

Since 1859



GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

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Controlled Slurry Recirculation EFFECTIVELY TREATS



PHIS ACCELATOR® is chemically treating 500,000 GPD of waste water at Rock Island Refining Corporation, Zionsville, Indiana. Using lime and ferric sulfate as coagulants, the ACCELATOR consistently delivers an effluent containing only 5 PPM suspended solids and 8 PPM oil.

Here is another example of INFILCO'S equipment performance in the chemical treatment of industrial wastes .. using INFILCO knowledge gained through more than a half century of pioneering research and the manufacture of a complete line of water and waste treating equipment.

Take full advantage of the valuable service and unbiased recommendations of our competent engineering staff. They are prepared to help your engineers solve your waste treatment problems. Call our nearest field engineer or write us for complete information today. There is no obligation.

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rocter & Gambia

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Canceral Matters Corporation.

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Refinery Waste Soluble Oil Wast Refinery Wastes

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BETTER WATER CONDITIONING . AND WASTE TREATMENT SINCE 1894

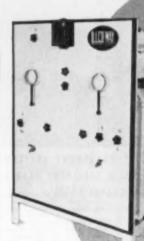
INFILCO INC.

OFFICES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

The <u>Complete</u> Line of "Packaged" DE-IONIZERS

(Right) Portable Mined-Bed De-teniner provides tracted water with specific resistances up to 15,001,000 chms. These units, with flow rates up to 30 gph, ore essentically designed for use in informatories or wherever small quantities of high purity water are required.



(Above) Industrial
De-ioniner, one of a
series providing
solids-free water comparable to single-dutilled water. Flow rates
up to 1,000 gpb. Shipped
completely assembled with
full accessories for operation
including parity indicator. Units
can be furnished with materials for
allied, and CO's removal. Floor space.
appet a 5 a 2 Meight approa 1 ft



Industrial
Industrial
Industrial
Mixed Bed
Deioniserprovides treated
water, with specific resistances
up to 15,000,000
ohms. Shipped completely assembled,
ready for operation,
with full accessories including purity indicator.
Flow raises up to 600 gpb.
Height: approximately 7 ft.

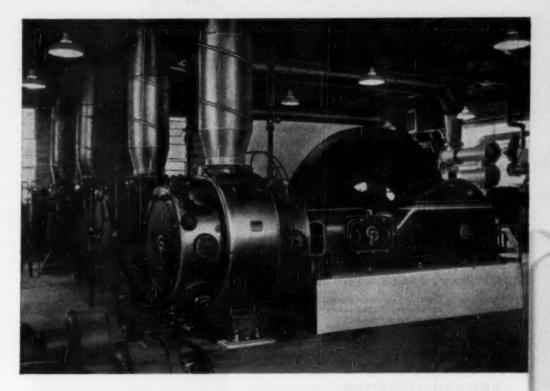
(Left) Popular Portable De-ionizer provides solids-free water comparable to single-distilled water. Flow rates up to 30 aph. This veroatile sodel can be furnished with materials for silica and CO₂ removal.

Requirements for pure water in many plants are served by these famous "packaged" units... quickly available, quickly installed. For greater flow requirements, ILLCO-WAY industrial installations are engineered to provide any flow, any volume on a given water supply. A typical 300 gpm installation is shown at left. Write today for detailed information.

ILLINOIS WATER TREATMENT CO., 844-9 Ceder St., Rockford, Illinois • 7310-89 Empire State Bldg., New York City



DE-IONIZING DE-ALKALIZING SOFTENING



where process work depends on around-the-clock Air Supply

Wherever the demand is for a dependable supply of air in large volume — 24 hours a day — Chicago Pneumatic Class O is the ideal compressor.

Of horizontal duplex, heavy duty construction, it is designed expressly for continuous service with utmost reliability and high overall efficiency. Its light weight, quick-acting Simplate valves minimize power consumption and provide high volumetric efficiency. CP Multi-Step Control handles partial loads economically.

Ranging from 75 to 2,000 h.p., Class O Compressors are available in single and multi-stage designs, steam and electric drives, for a wide range of pressures.



PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Write for full information.

SHREDDING

THE PREPARATION OF MATERIAL

During Processing Operations Reducing Waste Material for making a by-product Salvage Purposes Use as fuel

MANY INDUSTRIES SERVED BY

JEFFREY SHREDDERS

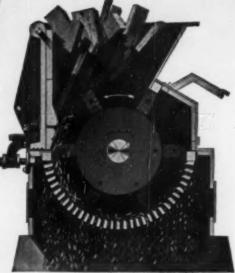
Pulp and Paper Mills
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MANY MATERIALS REDUCED

Sugar	Cork
Bagasse	Screening
Chips	Citrus Fru
Knots	Straw
Slivers	Wood

Insulating
Materials
Drugs
Chemicals

Pulp Laps Shavings Magazines Cornstalks Rubber



TYPE B HAMMER HOG (above)

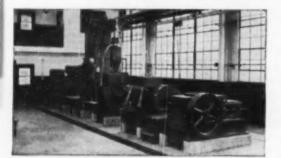
Ideally suited for the reduction of wood refuse containing nails, spikes. No sharp edged knives to require frequent sharpening—no damage to working parts. This and other types shown and described in Catalog No. 805.

HIGH CAPACITY UNIFORM REDUCTION

Jeffrey Shredders are well built and properly designed — in various types for handling the different classes of

material — a wide range of sizes some with metal catchers — to suit capacity requirements.

Our modern test laboratory (left) enables us to determine the proper type and size of machine best suited to the need in advance of expenditure or installation. Sample of material may be furnished, if desired, with results kept in strict confidence.



PULVERIZERS SINGLE ROLL CRUSHERS
DOUBLE ROLL CRUSHERS
FLEXTOOTH CRUSHERS
ROTARY RING CRUSHERS BALE BREAKERS
METAL TURNINGS CRUSHERS
SEWAGE SCREENINGS & GARBAGE GRINDERS
SEND For Information

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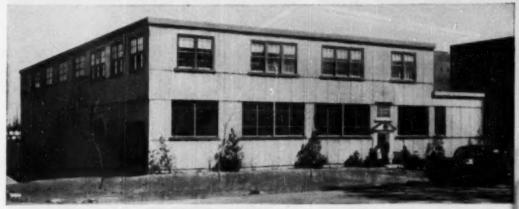
MANUFACTURING COMPANY Established 1877
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CORRUGATED TRANSITE*...for offices



The office annex of a chemical plant-with Corrugated Transite providing a clean-cut, modern exterior that is maintenance-free.



Corrugated Trensite on a power plant. Rugged performance for industry is now only one phase of Transite's widespread acceptance in construction.

Adaptable to practically every type of building, large Corrugated Transite sheets provide a modern streamlined appearance, save money on both construction and maintenance. Tough Transite sheets can't burn, rot, or rust—and they're not expensive.

THE USE of Corrugated Transite for office buildings is comparatively recent. This rugged asbestos-cement sheet first came to the attention of architects and engineers as a long-lasting, economical type of exterior siding and roofing for industrial buildings, many years ago.

When in recent times it was found equally adaptable for modern streamlined construction, its acceptance became so widespread for every kind of building that production has never quite caught up with the demand.

Corrugated Transite is firepress, respreed, weatherpreed. It requires no preservative treatment, is highly resistant to acids and fumes, and it requires little or no upkeep.

The large sheets permit rapid application. When need for alteration arises, the sheets are practically 100% salvageable. Write Johns-Manville, Box 290, New York 16, N. Y.



EASY TO FASTEN TO STEEL



EASY TO SAW



EASY TO DRAL

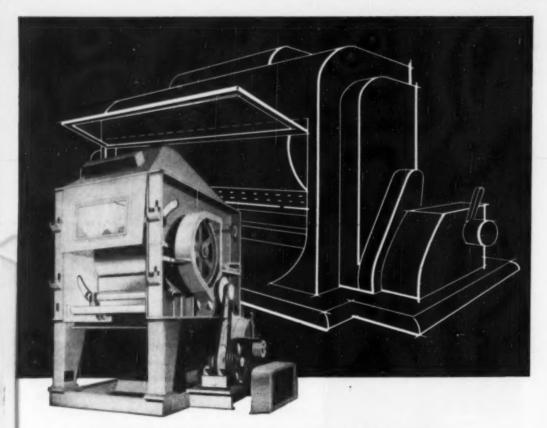


EASY TO NAIL TO WOOD



Johns-Manville Ashestos corrugated transite





GUINEA PIG for Your Drying Problems

This experimental drier and flaker has a vital mission to perform for the chemical, plastic, food, drug, paper, textile and allied industries. It was built by Lukenweld with a two-fold purpose . . . (1) to help industrial concerns solve their drying, cooling and flaking problems and, (2) to point the way to practical improvements in drying machinery and methods.

The machine is designed for operation under all sorts of conditions with various heating and cooling mediums at speeds from 10 to 1100 feet per minute and internal pressures up to 200 psi. To permit corrosion, erosion and heat transfer tests, interchangeable 24" face, 24" diameter, single and double shell rolls of various corrosionresistant metals have been provided.

This is typical of Lukenweld Research Projects designed to develop engineering data which will reduce the cost and improve the performance of machines and equipment . . . one of the extras you can expect when you put your process machinery problems up to Lukenweld. With the experimental drier described, you can have us make an analysis of your drying, flaking or cooling operations with an eye toward increased production, lower costs and reduced maintenance. Address, Lukenweld, Division of Lukens Steel Co., 400 Lukens Bldg., Coatesville, Pa.

Improved machinery for improved processes through engineering

LUKENWELD



LOOKS right!

Beautifully constructed of gleaming stainless steel, it looks and performs like a thoroughbred.

WORKS right!

Made stronger, lighter and safer and it will give you many years of trouble-free operation.

PRICED right!

You'll be amazed at how inexpensively you can guard against fire with this superior extinguisher.

Kidde's New 21/2 Gallon

STAINLESS STEEL
FIRE EXTINGUISHER

gives you more for your money!

All stainless steel shell means greater strength, lighter weight, safer construction, years of reliable service . . . with the same instantaneous action and sure protection against fire that Kidde has always given. Transparent nozzle lets you see at a glance that nozzle passage is clear. Permanent nameplate with directions can not fall off.

Take your choice of clear water, soda-acid or foam type and get all the advantages of Kidde construction and Kidde "know how." Also available in an Anti-Freeze type, made of silicon bronze, which eliminates the danger of corrosion that usually results from the Anti-Freeze solution.

Ask your Kidde Dealer or write us for complete information today.



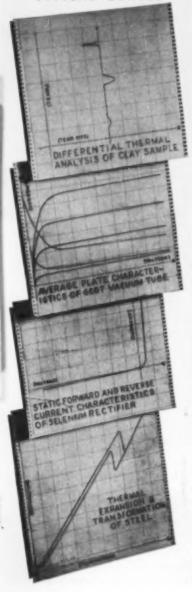


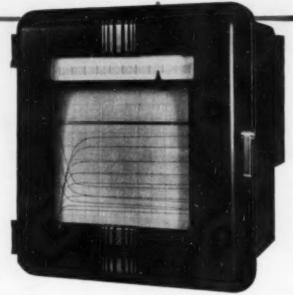


Walter Ridde & Company, Inc., \$28 Main St., Belleville 9, N. J. In Canada: Walter Ridde & Company of Canada, Ltd., Montreal, P. Q.

Now you can plot X vs. U.. automatically

TYPICAL CURVES





with the

New Speedomax 2-Function Recorder

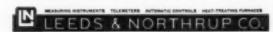
Boon to engineering and research laboratories, this new Speedomax Recorder automatically plots a continuous, accurate curve showing the relationship between any two variables brought to the instrument in the form of d-c signals. Gone are those hours of tedious compilation and point-by-point plotting of data.

Just glance at these typical curves and note the instrument's remarkable versatility. Its big 10" chart provides remarkably complete detail. Potential applications are as broad as a researcher's imagination.

This new X-Y Recorder has two electronic circuits, one for each function. X corresponds to horizontal pen travel; Y to up-anddown movement of the chart. Input voltage can be as low as 2.5 mv for X; 10 mv for Y. Response time is amply fast-just 2 sec for full scale pen travel (X); 4 sec per 10" of chart (Y).

For details, send for Folder EM9-420(1). Write us at 4916 Stenton Ave., Philadelphia 44, Pa.

Jrl Ad EM9-420[2]





Useful to Industry in NEW WAYS Every Day!



IN ALL ITS FORMS

BY COLUMN TO SERVICE OF THE PARTY OF THE PAR

world's largest producer of CO2

As a nation-wide source of supply, "LIQUID" offers industry dependable Carbon Dioxide of uniform high quality—for research uses or production applications. We will gladly discuss with you, your plans for adapting versatile CO₂ to aid you in the development or processing of your products... or to assist in working out more effective methods for your present use.



THE LIQUID CARBONIC CORPORATION

3110 South Kedzie Avenue . Chicago 23, Illinois

Producing Plants and Warehouses in Principal Cities of the United States and Canada

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THE LIQUID CARBONIC CORPORATION
3110 South Kedzie Avenue, Chicage 23, Illinois

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- Please send me a free copy of "A Chart of Industrial Uses" which tells of many of CO₂'s applications in industry.
-) Also, forward a list of RED DIAMOND CO₂ Plants and Warehouses.

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Street Address

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State_

NON-STOP PERFORMANCE

Pumping 98% sulphuric acid for 28,000 consecutive hours

After 28,000 hours of continuous operation, in which more than 125,000,000 gallons of 98% sulphuric acid had been handled, the Ohio plant that owns this LaBour self priming packingless Type G pump shut it down for inspection. Except for bearing lubrication, 28,000 hours continuous service was entirely without maintenance cost.

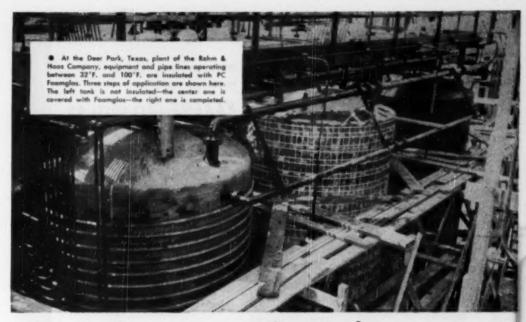
This record is no accident. For 27 years LaBour pumps have been built for dependable service. From basic design through strict metallurgical control of castings and on to final searching test before shipment, LaBour heads off the troubles that could interrupt chemical plant operations.

That's why the toughest jobs in the industry are done by LaBour pumps. It's also why all applicable jobs are given to LaBour in plants that watch true costs and know how to hold them down.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. . Elkhart, Indiana, U.S.A.



For the tough jobs-

PC FOAMGLAS—the long life insulation

PLANT managers have found, in PC Foamglas, the solution to many of their most pressing insularing problems. The unique properties of Foamglas make it the detal insulating material for indoor and outdoor piping, tanks, towers and other processing equipment. This unique material has proved its ability to meet exacting standards of insulating efficiency and to keep insulating costs low.

The cellular glass structure of Foamglas makes it an exceptionally effective insulation. And, being glass, it has unusually high resistance to moisture, vapor, acid atmospheres and other destructive elements. It is noncombustible, odorless and verminproof. Freedom from repairs, maintenance and replacement makes Foamglas a truly economical insulation. When properly installed, Foamglas retains its original insulating efficiency.

Foamglas is light in weight, rigid and strong. Being friable when subjected to point loading, it yields readily to surface irregularities, such as rivet heads and welds, thus can be pressed close to areas to be insulated without breaking or cracking. Foamglas comes in flat blocks, curved segments and beveled lags for processing equipment, and in preformed sections for standard piping. Fitting covers can be had from the factory or can be cut and formed in the field with ordinary tools.

When you are figuring on insulation, make sure you have the latest information on PC Foamglas. You will find it in our recently published booklet, which contains descriptive rext and photos of recent jobs, charts, tables, up-to-date specifications and installation instructions. Just send in the coupon and you will receive a sample of Foamglas and your copy of our literature.

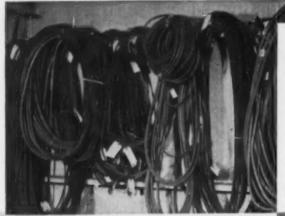


This is FOAMGLAS

The corire strong, rigid block is composed of millions of sculed glass bubbles. They form a continuous structure which has answelly high resistance to moisture, vapor and soid atmospheres, is noncombustible, vermingreaf and adardess. In those closed glass cells, which contain still air, lice the cert of the material's long life insulating efficiency,

FOAMGLAS INSULATION

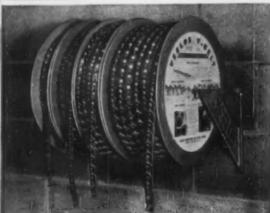
... when you insulate with FOAMGLAS ... the insulation lasts!



when you use v-belts, remember...

VEELOS CUTS COSTS ON V-BELT INVENTORIES

This large stock of endless v-belts is as unnecessary as it is costly and hard to keep under control. Switch to Veclos—the adjustable v-belt—and stop forever all this useless waste of time, space and money.



when you use v-belts,

VEELOS IN STOCK MEANS ANY SIZE BELT IS INSTANTLY AVAILABLE

Just four reels of Veelos can take care of as many as 316 sizes—every v-belt need in the O, A, B and C widths. No cluttered stockroom, no control problem, no replacement difficulties when you standardize on Veelos in the widths you require.



V-BELT

when you use v-belts, remember...

VEELOS KEEPS MACHINES AT PEAK PRODUCTION

Veelos runs true for vibrationless, full power delivery. Veelos installs quickly and easily—and you never need to dismantle outboard bearings. Veelos can be simply adjusted to maintain uniform tension on all belts.

And, as a reminder . . .

Write for your free copy of the Veelox Data Book and have all the facts on this adjustable v-belt at your fingertips.



ADJUSTABLE TO ANY LENGTH . ADAPTABLE TO ANY DRIVE

Mode in all widths in three types: regular, all-proof, static conducting. Also double V in A and B. Packaged on reefs in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. Veeloo is known as VELINK outside the United States.

MANHEIM MANUFACTURING & BELTING COMPANY, MANHEIM, PA.





It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request.

No internal wearing parts. No valves, pistons, or vanes. No internal lubrication. Low maintenance cost. Saves floor space. Desired delivery temperature automatically maintained. Slugs of liquid entering pump will do no harm. 75 pounds in a single stage.

NASH ENGINEERING COMPANY
325 WILSON, SO. NORWALK, CONN-

DO YOU KNOW.. 's possible

TO GO THROUGH MANY HEATING SEASONS WITHOUT UNIT HEATER MAINTENANCE EXPENSE, providing that yours is a GRID installation? It's possible, and is being done by major chemical plants, who have investigated and installed GRID equipment. No other unit heater incorporates these features that are vital to proper and efficient chemical plant heating. It's possible because:

cast iron construction withstands corresive fumes.

wide fin spacing facilitates easy cleaning.

will withstand steam pressures up to 250 lbs., and is free of electrolysis.

fins are cast integral with the steam chamber assuring even dis-tribution of heat. It's not possible for GRID fins to come loose from the steam chamber to cause loss of heating officioncy.

design incorporating proper fan sizes, motor speeds and outlet temperatures results in a properly balanced heat-ing unit, especially when high steam pressures are used.

quipment

LL STAND UP UNDER CONDITIONS PECULIAR TO THE CHEMICAL INDUSTRY.....

HERE'S THE PROOF FROM ONE OF OUR USERS. IN YOUR OWN INDUSTRY

GRID BLAST COILS . . . for Drying, Tempering outside air. Process work . . .



For tempering outside air, drying, process work, GRID Blast Coils have the same high efficiency and lasting qualities as GRID Unit Heaters . . . heating sections the same ONE piece construction high test cast iron guaranteed for steam pressures up to 250 lbs. . . . no electrolysis . . . no tortuous air passages . . . freedom of expansion with complete absence of ruptures, strains and warping . . . open design for easy cleaning .. atmospheric conditions such as dust, fumes, etc., cannot retard their operation. Compact they occupy less space than other types of cast iron blast coils of equal ca-

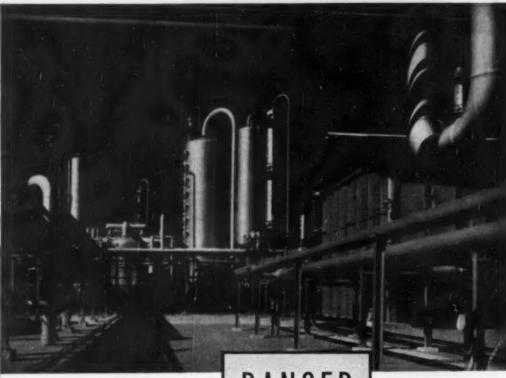
Centlemen:
The first CRID Unit Heaters
The first CRID Unit Heaters were installed by us eight years were installed by us eight years ago. We have found the cast iron ago. We have found the cast iron to the construction stands up very well against the corrosity very fulled the corrosity to the corrosity to the corrosity of the corrosity and would certainly recommend these for installation where corrosity acid fuses exist.

Yours truly, A LARGE EASTERN CHEMICAL PLANT



Write today for Correcion" Booklet catalog CUH-850-CE-satalog GRID BLAST COILSall yours on request.

D. J. MURRAY MANUFACTUR WAUSAU



THERE ARE NO

DANGER

SIGNS!

In chemical plants using CONSOLIDATED Safety Relief Valves, danger from valve failure has been eliminated. In no other valves are there the extra safeguards which protect materials in process, plant equipment and workers.

The fixed capacity is built-in. Safety in operation does not depend on the position of multiple adjustable blow-down rings. One adjustment controls blow-down without disturbing lift or secondary annular orifice area. The outside bevel seat and floating

guide construction positively eliminate leakage under discharge piping stresses. You have dependable tightness under all operating conditions.

There are 25% fewer parts in CONSOLIDATED Safety Valves compared with other valves. This basically simple design cuts maintenance costs and minimizes standardization problems.

There should be no compromise when safety is involved. Specify only "CONSOLIDATED" when planning for or buying Safety Relief Valves.

For complete information phone or see your local distributor.

CONSOLIDATED SAFETY VALVES



A Product of

MANNING, MAXWELL & MOORE, INC.
TULSA, OKLAHOMA

Makers of 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments, 'Hancock' Valves, 'Ashcroft' Gauges, Builders of 'Shaw-Bas' Cranes, 'Budgit' and 'Load Lifter' Moists, and other lifting specialties.



Chemical and Physical Properties of Fused Alumina Filter Plates



Norton Alundum" paraus plates, unaffected by acid, neutral and slightly alkaline liquors, combine uniform perceity with great strength.

Made of fusad alumina, fired to at least cone 12, Norton Alundum porous plates are relatively unaffected by acid, neutral and slightly alkaline liquors. The high alumina glass bond may be affected by strong and hot sodium and potassium hydroxides and by hydrofluoric acid. The following table shows the results of solubility tests under exacting conditions with standard 12" x 12" x 1" Norton Alundum porous plates.

Percent, Camulative Lass - Same Mate Alternating Hot and Cold

Last of 30 Days 197 Hrs. at 85-100° C. 528 Hrs. at 20° C. 394 488 .578 .232 .234 .674 .397 .388 et 20°C .062 2.302 et 20°C. .062 .076

SOLUBILITY	A TECTE

SOLUBILITY	515	Loss at 10 Days	Loss at 20 Days	
Solution	Strangth in Parcent	75 Mrs. at 85-100° C. 169 Mrs. at 20° C.	131 Hrs. at 85-100° C. 349 Hrs. at 20° C.	
Phosphoric Acid	85.00	.373	.522	
Phosphoric Acid	42.50	.290	.362	
Sulphuric Acid	96.00	.326	,444	
Sulphuric Acid	25.00	.391	.494	
Nitric Acid	70.00	.149	.187	
Nitric Acid	22.00	.130	.167	
Hydrochloric Acid	35.00	.354	.528	
Hydrochloric Acid	20.00	.292	.352	
Hydrofluoric Acid	.25	.602	.644	
Sulphuric Acid	1/5 of 96.00)			
Nitric Acid	1/20 of 70.00	.188	.318	
Ammon, Hydroxide	28.00	et 20°C046	et 20°C057	
Sodium Hydroxide	10.00	.937	1.453	
Colcium Hydroxide	Sat. Sol.	et 20°C032	et 20°C046	
Ammonium Chloride	10.00	.041	.053	
Zinc Chloride	10.00	.084	.123	
Zinc Chloride	5.00	.032	.044	

Only in the case of sadium hydroxide were edges of plates affected. A slight rounding web neticeable as was to be expected.

UNIFORM PERMEABILITY

Because of Harton's patented "Controlled Structure" process, Alundum parous plates meet extremely rigid specifications for uniform permeability. The size and number of open pares determine permea-bility. The following table gives approximate pare sizes for different perceities and permeabilities. Permeability is given in cubic feest of oir passed per minute on a dry plate 12" x 12" x 1" under 2"

Parmosbility	Forcest of Fore Space by Volume	Avg. Dia. of Pares	
4 cubic feet	36	0.09 mm,	
20 cubic feet	35	0.21 mm.	
40 cubic feet	34	0.30 mm,	

*Trade-Mark Reg. U. S. Pat. Off. and Fareign Countries

GREAT STRENGTH

The following table of tests on standard Alundum $12^{\prime\prime} \times 12^{\prime\prime} \times 1^{\prime\prime}$ peroplates of various permeabilities indicates the ability of these plates to apera under high pressures and to resist breakage and chipping due to handlis and cleaning.

Average Fermenbility of Dry Plate, as 9/min/sq 91/ in, thick./at 2 in, Water Prenore	Average Madelus of Repture, psi		Breaking Lond when Wat Plate is Supported on Four Sides with 1/5" Bearing	
	Dry	Wet	Ft. of Water	F/104. In.
121.0	1670	1465	97	42
80.9	1950	1685	110	48
37.8	2684	2235	147	64
16.9	3045	2644	175	76
4.1	3770	3714	244	107



GET BULLETIN 140

All of the foregoing data, as well as detailed installation and cleaning instructions, are contained in a

highly informative 16 page bulletin. To get it, contact your nearby Norton representative or write direct. NORTON COMPANY, 501 NEW BOND ST., WORCESTER 6, MASS.



Making better products to make other products better

Special REFRACTORIES

A. P. GREEN FIRE BRICK CO., LId. TORONTO, ONTARIO

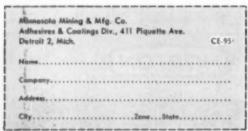


MURIATIC ACID CARRIER protected with "Coro-Gard" coatings shows no exterior corrosion after full year of heavy service.

Metal protected by 3M coating systems is safe from acid!

Tough assignment—protecting tank car exteriors against spillage of muriatic acid. Yet "Coro-Gard" coatings do the job easily. These tough vinyl-base coatings give long-lasting protection to any metal—guard it against damage from chemicals, fumes, fresh or salt water, petroleum products and mechanical abrasion.

Our engineering service will help select the correct "Coro-Gard" Protective Coating System for your special metal corrosion problems. Just mail the coupon today.



MAR COUPON for free information about our 15 Specific Protective Coating Systems. Our engineers will be glad to recommend the proper system for your operations. They'll help you figure costs, show you the savings to be made with a protective coating system designed for a specific job.



EATEN AWAYI With conventional coating, tank-car rivets and plates are badly corroded from muriatic acid spillage after only a few months' service.



PROTECTED! With a "Coro-Gard" Protective Coating System, tank car is smooth and clean after 1 year's service—ready for many months more of hard usage.



Made in U.S.A. by MINNESOTA MINING & MFG. CO., ADHESIVES AND COATINGS DIV., 411 Figuette Ave., Detroit 2. Mich. Alao makers of "Sootch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underneal" Rubbertzed Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Nos-Silp Surfacia, "3M" Abrasives, General Offices, Saint Paul & Minnesota, General Export: Durax Abrasives Corp., New Rechalle, N. Y. In Canada: Casadian Durax Abrasives Ld., Brantford, Ontario.



When you're looking for

LEAD PIPE

to keep corrosive chemicals in line

The chemical industry relies on lead pipe to convey corrosive materials.

It relies on National Lead to supply this pipe in the proper form and alloy for each specific application.

National supplies lead pipe in several grades and types as well as in all weights and sizes.

The grades include chemical, antimonial, tellurium, telluriumantimonial. And the new Nalco Metal for chromium platers. All are made from "St. Joe chemical lead."

For installations requiring extra structural strength, National makes "United" and "United Tubond" lead-lined pipe and fittings. Both combine the corrosion resistance of lead with the strength of steel. All linings are seamless, smooth bore, and of uniform wall thickness.

When you buy lead pipe, specify National—and take advantage of metal resources, mechanical equipment, and production facilities that are unmatched. National has manufacturing plants in all principal cities.

...look to the Leader in Lead

...in everything from lead pipe...valves...dueet... and lead-lined or lead-covered equipment...lo complete acid recovery plants.

NATIONAL

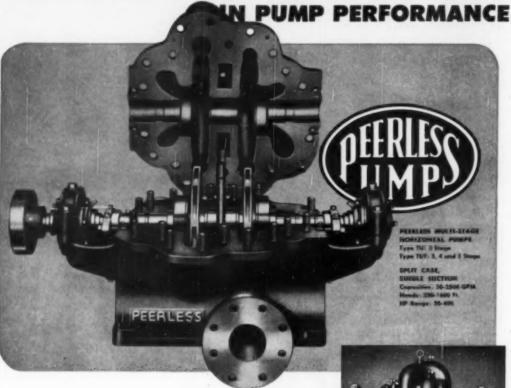
LEAD COMPANY

New York 6; Atlanta; Baltimore 3; Baffalo 3; Chicago 4; Cincinnott 3; Cleveland 13; Philadelphia 25; Putthorph 12; 9; Louis 1; Boston 6 (National Load Company of Mass.); Los Angeles 23 (Morris P. Kirk & Son. Inc.); Toronto, Canada (Canada Hetal Co. Ld.).



Tredemorks

PEERLESS PROVIDES A PLUS



HERE'S A DEPENDABLE, DURABLE AND RUGGED MULTI-STAGE PUMP FOR HANDLING HOT OR COLD LIQUIDS IN MOST PROCESS APPLICATIONS

Peerless Type TU and Type TUT multistage horizontal pumps squarely meeyour requirements where moderate capacity and high head applications in handling boiler feed water and process liquids are involved. In general, these pumps are of horizontal, split-case design. They incorporate a number of features that provide a plus in pump performance without paying a premium on your investment.

For enample: Peerless TU and TUT pumps are equipped with duplex angular contact thrust bearings, water cooled bearing housings, heavy stiff case rings, sleeves locked against impeller hubs, in-and-out cooling and sealing connections at stuffing box.

The return passages from discharge to suction of the impellers is the best method developed over a period of years for converting velocity into pressure between stages providing a definite improvement in efficiency.

The high pressure stuffing box on these pumps is under one stage pressure only, regardless of the net pressure developed by the pump.

The spacer bushings between stages are serrated with grooves throughout its length, are longer than competitive pumps thus making an effective seal between stage pressures.

Peerless Type TU and TUT pumps can be furnished in a variety of materials and alloys for use in most process applications.

Peetless Type TU and TUT pumps are described in Bulletin B-301. Write for your copy today.



Exterior view of Type TU 2 stage pump showing internal cross over as furnished on 4" size and smaller.



View in booster station shows Type TUT 3-stage pumps each handling 325 gpm of process water at 600 ft, hood.



PEERLESS PUMP DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION

Pacteries: Les Angeles, California, and Indianapolis, Indiana.

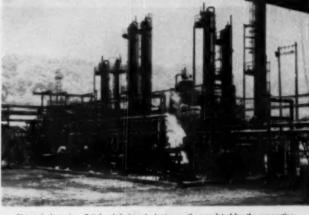
Offices: New York, Arlanta, Chicago, St. Lauis, Phoenia, Frence, Los Angeles;
Dallas, Plainview and Lubback, Texas; Albuquerque, New Mexico.





CHEMICAL DIVISION





Pictured above is a Pritchard designed plant recently completed for the separation of quality grade manachiar and dichlar beazens from crude chlorinated beazenss.

For Superiority of Product Depend on Pritchard Designed Plants

Superiority of product ... maximum plant efficiency and ease of operation...longer periods of "on stream" operation with freedom from maintenance troubles — these are the things for which Pritchard chemical plants are becoming known and talked about throughout the industry today.

Pritchard's services are flexible. For those who desire complete "turnkey" service to include everything from analysis of requirements to final operating tests, Pritchard offers its single responsibility contracts. For those who desire to supplement the work of their own permanent engineering staff and relieve them of the extra work load of new plant design, engineering, procurement or construction, Pritchard stands ready to assist them as the project may require.

You are invited to make use of Pritchard's diversified experience in the chemical field to make your next plant construction, modernization or extension outstanding in the industry.





J.F. Pritchards Co

DESIGN . ENGINEERING . CONSTRUCTION

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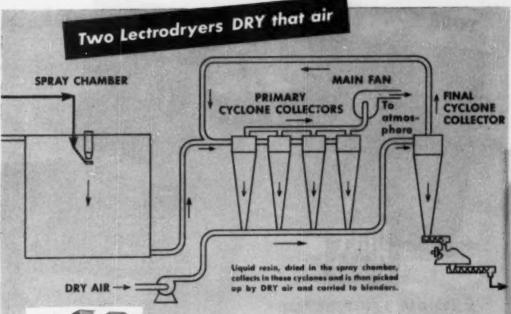
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DESIGN
ENGINEERING
and CONSTRUCTION
for
INDUSTRY



DRY AIR PICKS UP POWDERED RESIN





Two of these Type CHT Lectrodryers serve this operation at American Cyanamid's ultra-modern plant at Wallingford, Connecticut.

Get molding powders DRY and keep them that way-that's the function of this portion of the production line in this American Cyanamid Company plant. Over three million pounds a month can be produced here

Elsewhere in this plant, other Lectrodryers work in conjuction with York refrigeration machines to hold processing and packing rooms at constant humidity and temperature. Thus the high quality of products made here is maintained.

Whatever your DRYing problem-air, gases or organic liquids, at low or high pressures, in small or huge quantities-there's a Lectrodryer to serve you. Our engineers are skilled at assisting in applying DRYing to speed production and preserve product quality.

For this help, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pa.

in England: Birloc, Limited, Tyborn Boad, Erdington, Birmingham. In Australia: Birley, Limited, 51 Parrametta Boad, Glabo, Sydney.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

CHEMICAL ENGINEERING-September 1950

Special or normal...



GAIN TIME - Wide experience enables Ross engineers to be of genuine assistance to you . . . whether your conditions call for single or multistage units, with or without surface or barometric inter and after condensers. Feel free to consult.

Conedo, Horton Steel Works, Limited, Fort Erie, Ont. ROSS HEATER & MFG. CO., INC.

ply selecting the most suitable size steam nozzle and other parts, normal requirements can be quickly accommodated. And by the same token,

so-called "special" conditions are quickly met,

too . . . some through modification of standard

units . . . others through individualized engineers

ing and fabrication.

Serving home and industry

TARO . AMERICAN RIOWER . CHURCH SEATS . DETROIT LUBRICATOR . KEWANEE BOILERS . ROSS HEATER . TONAWANDA IRON

take the Hackney Cylinder Way to lower cost shipping of all types of gases

FLUORINE HYDROGEN FLUORIDE

VINYLCHLORID

No matter what types of gases you ship -you'll find a strong, lightweight Hackney Cylinder especially designed for the job.

Designed with shippers' requirements in mind, they're lightweight to assure exceptional shipping and handling economies. Their rugged strength protects your product every minute-in storage and transit.

This outstanding light weight and

strength are made possible by the Hackney Deep Drawing Process. This manufacturing method assures uniform sidewall thickness; eliminates excess material. Then, after complete fabrication, controlled heat-treating is employed to improve the physical properties still further.

Write for full details on Hackney cylinders-the cylinders that really protect your product and lower your cost doing it.

COMPANY PRESSED TANK

Manufacturers of Hackney Products

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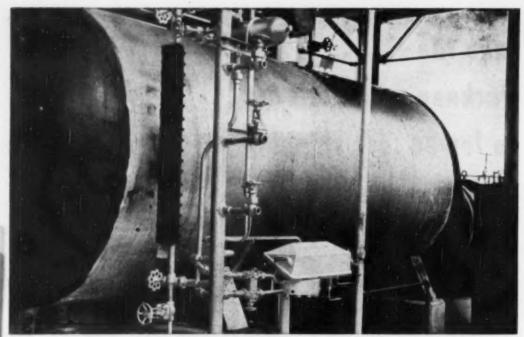
936 W. Pouchtree St., N.W., Rm. 113, Atlanta 3, Georgia

208 S. LuSalle St., Room 792, Chicago 4

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Hackney

CONTAINERS FOR GASES, LIQUIDS AND SOLIDS



Republic Transmitter measuring level in reboiler

DIFFERENT... in design and performance

The Republic Pneumatic Transmitter is a device for converting process variables, such as flow, level, pressure or liquid density, into air pressures. These air pressures are a direct measure of the process variables or can be used as the measuring impulse for the actuation of an automatic controller.

The force-balance method of measurement, as employed by the Republic Pneumatic Transmitter, offers many inherent advantages such as:

AMBIENT TEMPERATURE — The effect of ambient temperature variations on the accuracy of a Republic Transmitter is negligible. Since all parts are equally affected by temperature changes, force and leverage relationships are not disturbed and accuracy is unimpaired.

AIR SUPPLY PRESSURE—The effects of changes in air supply pressure is so small that it is guaranteed negligible.

LINE PRESSURE - The effect of variations in line pressure has been completely eliminated.

SENSITIVITY—Due to the negligible motions required for complete operation of all parts for full scale changes, no appreciable hysteresis results from reversal of direction of measurement change. The hysteresis loop is so small that it is undetectable by ordinary means, being less than 1/20 of 1%.

ACCURACY — The accuracy of the Republic forcebelance method of measurement is higher than can be consistently secured and maintained with any other method. Transmitting pressure vs. measured force is guaranteed within ½ of 1% of meter range.

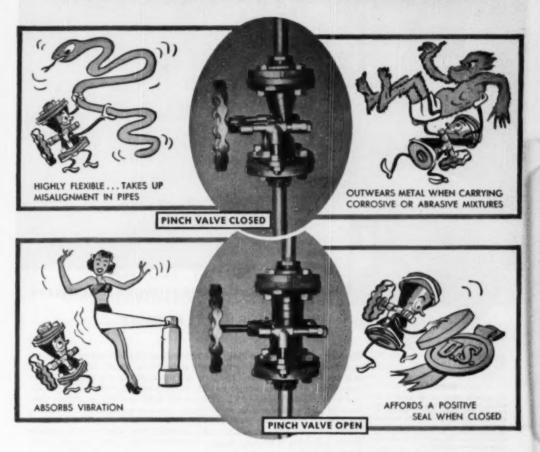
In addition to these five important features, the Republic Pneumatic Transmitter is extremely flexible in application, easy to service and of rugged construction.

If you have a flow, level, pressure or liquid density metering or control problem may we suggest that you investigate the Republic Pneumatic Transmitter? Data Book No. 1002, which contains complete details of this instrument, will be mailed to you upon request. Write for it today!

REPUBLIC FLOW METERS CO.

2240 Diversey Parkway, Chicago 47, Illinois

NEW PINCH VALVE SQUEEZES OUT NEW PRODUCTION ECONOMIES



FUNCTIONS—For use on pipe lines carrying abrasive, corrosive mixtures or raw chemicals. Eliminates "water hammer." Breaks up galvanic action in pipe lines. Can be operated partly open to control flow.

CONSTRUCTION—Abrasion-resistant or corrosion-resistant compounds, or neoprene for oil resistance, or butyl rubber for high heat and severe acid conditions, or pure gum stock for food and beverage conveyance.

MAINTENANCE—Can be refitted to new valve bodies, reducing replacement costs. No packing or repacking needed. Compact design, with mechanism, retaining rings and pinch valve body in a single unit—an advantage where space is limited.

Let this new valve reduce your operating costs. Write to address below.



UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION . ROCKEFELLER CENTER, NEW YORK 20, N. Y.



PROBLEM

To provide a system for the extemplic or measure control of batching 2000 pounds of seed one conductor or binder savey 60 seconds. To coordinate batching machinery with the timed discharge of the extemplic cooles. To provide infallible electronic and mechanical checks to assure immediate stoppage of cycle when any phase of operation is incorrect.

SOLUTION:

A motoriofs handling system consisting of 9 bins, & evisionalis confee; I collector conveyor, I savival spool, I gold moders, master control penel; 2 skip hotels; 2 multors and respect flows. All weighting and control equipment designed, manufactured and instelled by Bichandians.

Working together, General Electric and Richardson Engineers solved an intricate problem in materials handling by weight at the Everett, Mass., G. E. Plant. Just as it was extremely important for G. E. to batch sand and core binder correctly and quickly, so it is increasing, ly essential for all processing industries to proportion accurately and rapidly the ingredients that make up their end product. Only through precise measurement by weight can plant operators be sure of turning out uniform, high quality products that are consistently profitable. And they are consistently profitable because accurate, automatic proportioning of ingredients results in batches of specified weights in minimum time. Costly customer rejects are eliminated.

Richardson Engineers are specialists in materials handling by weight . . . have designed feeding, weighing, proportioning and conveying systems for practically all the processing industries. For any problem in materials handling by weight, look to Richardson for the economical, efficient solution.

Feeder-Weighing Systems of All Types. Automatic Bulk Weighing Hopper Scales, Including Conveyor-Feed Types-Continuous Feeder-Weighers-Automatic Bagging Scales-Bag-Sewing Conveyors-Packers-Process Control Panels. Branch offices in: Atlanta · Boston · Detroit · Minneapolis · Cincinnati Wichita · Montreal · Omaha · New York · Pittsburgh · San Francisco Toronto · Buffalo · Chicago · Philadelphia · and Houston.



@ 6317



The preference for Worthington Compressors throughout the chemical industries is based not only on proved performance, but on getting the correct answers to questions like these:

How does the chemical composition of gas affect its behavior during compression? What is the preferred design of equipment for the specific gas to be handled? How can performance be improved when corrosive gas is being compressed?

Whatever your own compressor applications may be, there's a great deal of information you need to know. Worthington can give it to you. To users everywhere, this — backed by more than 50 years' experience in building and designing compressors for every purpose — has proved a worthwhile aid to more efficient, lower cost processing.

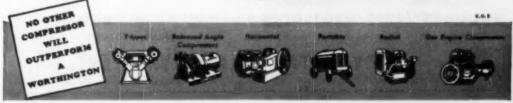
GET THE FACTS

Keeping pace with the chemical field's constant rapid progress,

Worthington builds compressors to handle the widest range of gases. Let us give you the facts on how their top performance combines with low operating and maintenance costs to prove there's more worth in Worthington. Write, describing your requirements, to Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, N. Y.

WORTHINGTON







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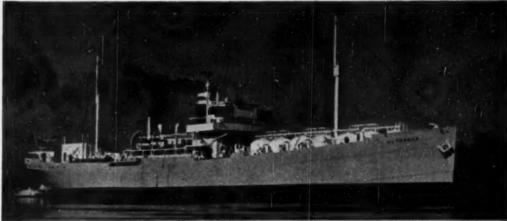
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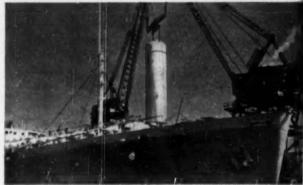
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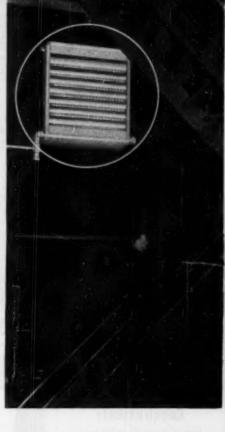
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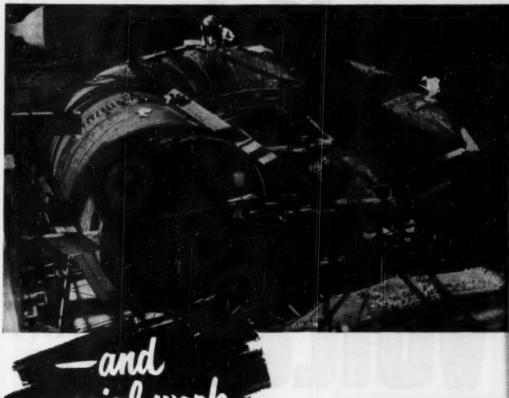
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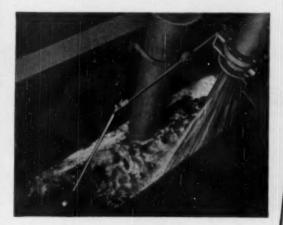
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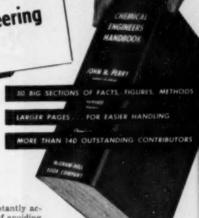
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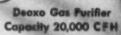
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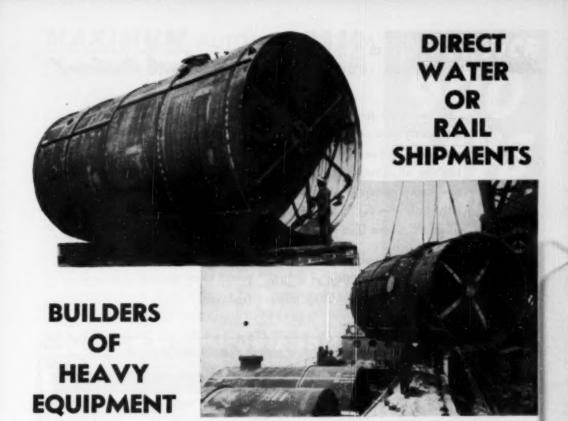
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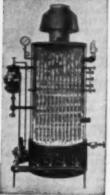
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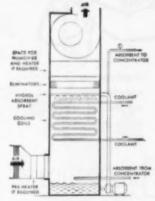
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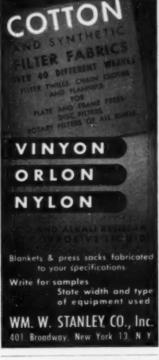
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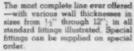
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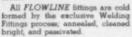




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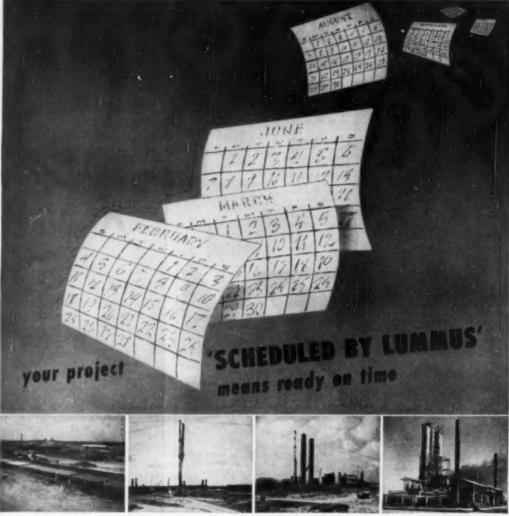
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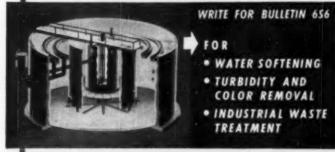
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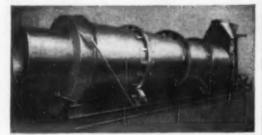


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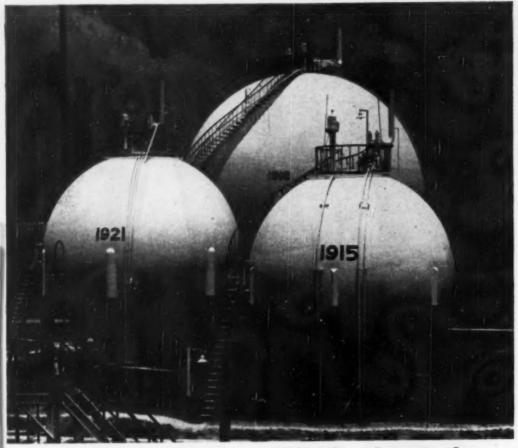
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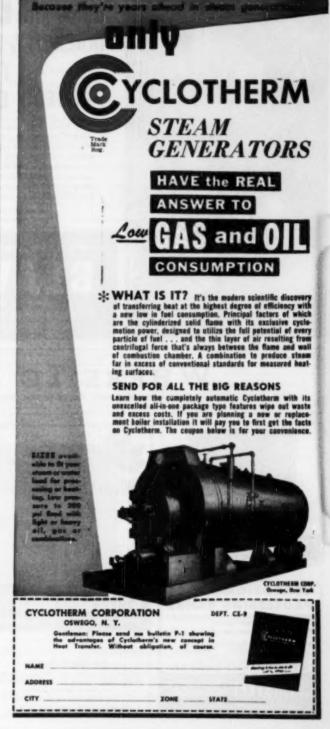
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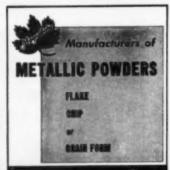
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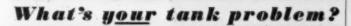
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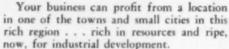


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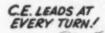
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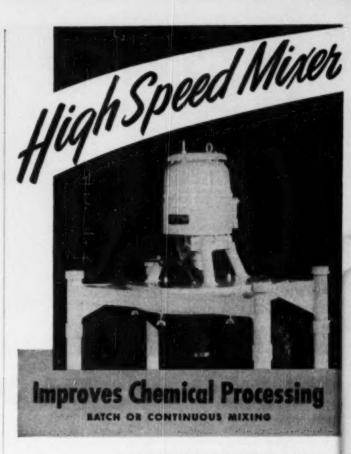
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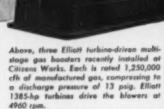
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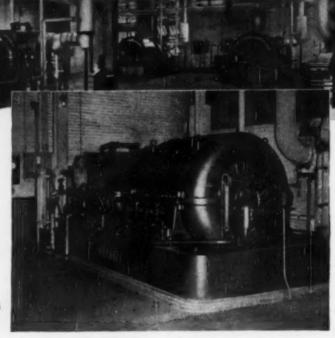
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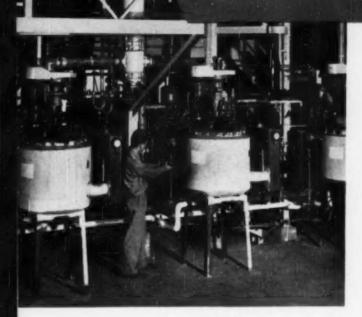
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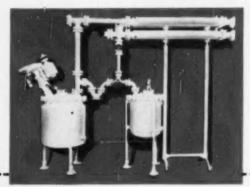
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For this reason, leading chemical manufacturers basically depend on Pfaudler acidresisting glass-lined steel equipment. It provides the same degree of corrosion resistance and freedom from contamination as laboratory glassware. It can be used for any acid (except HF) at elevated temperatures and pressures. Because of this, the equipment can be adapted for a variety of chemical conditions. You don't have to buy new equipment every time you try something new.

Pfaudler Pilot Plant Equipment duplicates the design of larger standard reactors in practically every detail—jacketed construction, similar designs for top heads, agitators and drives. Capacities: 5, 10, 20, 30, 50 and 100 gallons. Condensers, receivers, pipe, fittings, etc., and similar equipment also available in equivalent sizes and designs, permitting complete assemblies which are glass lined throughout. Thus, when you are ready to produce commercially, most of your equipment problems are already solved. Besides you keep pilot plant costs low. Let Pfaudler Engineers show you how to take advantage of these features.

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